



THE INTERNATIONAL  
REVIEW OF RESEARCH IN  
OPEN AND DISTANCE LEARNING

# Vol 19 No 3

July – 2018

## Editorial: Celebrating our Geographical Diversity – and Grit and Agriculture

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IRRODL is truly an international review. This 17-item issue, 2018's third, features a wide geographical spread of contributors, including four from the USA and only ONE from Canada (thanks, British Columbia). Without doing a detailed location-search, which I can only conduct manually, I believe that all continents, except the obvious (Antarctica) and South America, are well represented. Topically MOOCs are especially well represented, and we begin there, with four articles.

How do you teach a MOOC? Why do you teach a MOOC? **Lowenthal, Snelson, and Perkins** investigated these questions with 186 MOOC instructors. Although most were novice online teachers, they were also satisfied with their experience. As a long-time online instructor, I found these results intriguing, especially the fact that the study's instructors did not believe their course was as good as face-to-face: I believe the opposite of good online instruction!

And why do people sign up for MOOCs? **Wang and Baker** studied the relationship between learner intention to complete a MOOC and their actual completion status, comparing that relationship to the degree to which MOOC completion is predicted by other domain-general motivational factors such as *grit*, *goal orientation*, *academic efficacy*, and the *need for cognition*. They found that grit and goal orientation are associated with course completion, with grit predicting course completion independently from intention to complete, and with comparable strength. (Does this lend new import to the movie True Grit??)

**Poquet, Kovanović, de Vries, Hennis, Joksimović, Gašević, and Dawson** investigated how learners perceive social presence, and the different nuances of social presence in diverse MOOC populations, comparing perceptions of social presence across groups of learners with different patterns of forum participation in three edX MOOCs. The study provides insights into the current body of knowledge around social presence in MOOCs and raises questions about the effectiveness of transferring existing socio-constructivist constructs into the MOOC contexts.

**Hew, Qiao, and Tang's** study used a machine-learning classifier to analyze 24,612 reflective sentences posted by 5,884 students who participated in one or more of 18 highly rated MOOCs that exemplified good practices or teaching strategies and received an overall five-star course quality rating and received at least 50 reviews from different learners within a specific subject area. They describe six themes from the data: (a) structure and pace, (b) video, (c) instructor, (d) content and resources, (e) interaction and support, and (f) assignment and assessment.

From MOOCs TO OER...not a large leap. Four OER-related articles follow.

To shed light on the impact of open education resources (OER) on the employability of marginalized groups, **Chib and Wardoyo** studied open and distance learning in the context of low-income female migrant domestic workers as a marginalized community. This timely and socially relevant study concluded that while institutional learning, combined with employability awareness, had a significant influence on livelihood outcomes, this did not lead to actual improvements in learning or functional literacy. Rather, learning improvement was influenced by digital skills enabled by mobile phones and computers. The study concludes with a discussion on the policy implications.

**Ganapathi's** study, rooted in the fact that education is a fundamental human right, yet one-fifth of the world's population is illiterate, retrieved lessons from three children's content-providing organizations to understand the opportunities and challenges of OER in primary-level education in developing nations with similar cultural, infrastructural, and socio-economic issues. While the findings of this study suggest that the use of OER allows for greater distribution and scale across different cultural and linguistic settings, particularly in rural and remote regions, they also warn against the adaptation and pedagogical barriers of OER into societies where traditional modes of education are established and trusted.

The purpose of **Mason and Kimmons'** qualitative study was to understand whether certain theoretical benefits that open educational resources (OER) might have on teacher practice were being realized by a group of secondary teachers using open science textbooks. Most participants reported changes to practice, and the most commonly cited changes could be attributed to a combination of openness and online format. In comparisons of current to previous practice, however, teachers did not report increases in the open practices of collaboration, revising, or adapting. There is work to be done!

Likewise, in the Netherlands, to find out how to speed up the adoption of open sharing and reuse of learning materials in publicly funded higher education institutions, **Schuer and Janssen** conducted a qualitative research study that examined issues of willingness of educators and management, barriers and enablers of adoption, and the role of institutional and national policy in the adoption of open sharing and reuse of learning materials and online courses. Findings showed that motivation to use OER was related to the desire to create better learning experiences for students. Barriers to OER use included lack of awareness of opportunities for open sharing and reuse and a lack of time.

From OER to OEP, an area in which we are seeing more and more publications. From Australia, **Stagg, Nguyen, Bossu, Partridge, Funk, and Judith** provide a contemporary view of sector-wide OEP engagement in Australia—a macro-view that is not well-represented in open research to date. It identifies core areas of capacity that could be further leveraged by a national OEP initiative or by national policy on OEP. This first-phase research suggests that the experience of OEP across the sector is diverse, but the underlying infrastructure to support the creation, (re)use, and dissemination of resources is present.

ODL practices and processes – and problems – will always be topical. **Cabi** investigated the impact of the flipped classroom (FC) on learners' achievement and sought the opinions of learners about the FC. The results showed that there were no statistically significant differences between the scores of the two groups. These results echo other studies over the years that have revealed no significant difference between delivery

modes. The study identified FC problems, labelled motivation, content, and learning, and presented learners' opinions on advantages and disadvantages of the flipped classroom.

**Weidlich and Bastiaens** looked at the impact of transactional distance on satisfaction in online learning, extending Moore's seminal work of years past. Using a new scale for measuring transactional distance between students and the learning technology (TDSTECH), they conclude that TDSTECH is the single most important predictor of satisfaction for distance learners and suggest that this finding has important implications for practitioners trying to design and facilitate satisfying online distance learning experiences.

**Arshad and Akram's** paper investigates the impact of virtual environmental characteristics such as collaboration, communication, and resource-sharing on social media adoption by the academic community at university level. Findings suggest that an individual's propensity toward social media features (i.e., collaboration, communication, and resource sharing) acts as a stimulus to social media adoption. Moreover, perceived ease of use and perceived usefulness mediate the relationship between these stimuli and their outcomes (i.e., social media adoption).

Perhaps Unisa deserves special mention for two contributions in this issue? In her study of distance educator competence at Unisa, **Bezuidenhout's** 407 participants reflected on their experienced competency gaps that impacted them the most. From a strategic human resource development perspective, systems theory was used to explain the idea of maximising outputs with the minimum inputs. The results of this study have implications for capacity-building of academic staff in developing world contexts and other contexts where resources are scarce.

**Pilkington's** "playful" study explored promoting motivation in a distance third-year computer programming course via a gamified approach. The results of using gamification in education are mixed, and its use is controversial. There was little evidence that the gamification intervention led to behaviour change or improved scores; however, students responded very positively to the intervention, although some negative themes emerged. Was the effort worth it? Pilkington concluded that such playful approaches could have positive motivational effects.

And finally, also from Africa, **Tumbo, Mwalukasa, Fue, Mlozi, Haug, and Sanga** bring us interesting agricultural research from Tanzania, exploring how agricultural extension service can be geared toward teaching farmers how to develop innovative and cost-effective technologies given that advancements in ICTs have brought new opportunities for enhancing access to agricultural advisory and extension service for climate change adaptation. In Tanzania, a dire agricultural situation calls for new tools in order to understand hidden patterns from massive data. This study features a semi-automated text classification that was developed to determine keywords from a web and mobile-based farmers' advisory system that has been used for more than two years by more than 700 farmers.

IRRODL invites various kinds of "notes" in addition to fully developed research pieces. These notes are described on our website, in our recently revamped "Submissions" section, in which we attempt to give you as much information as possible to make the submission process clearer and easier for you. Two research notes follow.

**Barker, Jeffery, Jhangiani, and Veletsianos**, in their Research Note, identified, described, and illustrated eight distinct patterns of open textbook adoption: stealth adoption, adoption by infection, committee adoption, sanctioned exceptional adoption, course developer adoption, infection by inter-institutional carrier, creation and adoption, and lone adoption. The authors hope that identifying these patterns provides a useful framework for campus leaders to (a) understand how adoptions occur in their own contexts, (b) identify ways to support further adoptions, (c) recognize that there are multiple ways, and no single path, to supporting the adoption of educational innovations at their institutions, and (d) foster the embrace of wider open educational practices.

**Béché's** Research Note provides a literature review on open distance learning (ODL) in Francophone Sub-Saharan Africa, including research on topics such as the supporting reasons for the creation of ODL systems and their potentials; and success, difficulties, and issues linked to their implementation. The literature review shows that studies on ODLs in this area emphasize the representations, motivations, and identities of students and university managers, including the historical and cooperative aspects of these third-generation learnings. Further research must explore teaching and learning practices, evaluation, social and university transformations, and hybrid forms of learning.



July – 2018

# Teaching Massive, Open, Online, Courses (MOOCs): Tales From the Front Line

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## Abstract

Very little research has been conducted about what it is like to teach a MOOC. Given this, a mixed methods study, involving a survey of 186 MOOC instructors and 15 follow-up interviews, was conducted to explore the motivation, experiences, and perceptions of instructors who have taught massive open online courses. Findings indicate that instructors were motivated to teach MOOCs for three main reasons: (1) interest and passion, (2) publicity and marketing, or (3) benefits and incentives. Most instructors had little online teaching experience prior to teaching their first MOOC, but were satisfied with the experience. The majority believed their own MOOC provided a high quality learning experience but thought that MOOCs overall might not be as good as face-to-face courses. Concerns were raised about the future of MOOCs for online learning.

*Keywords:* massive open online courses, MOOCs, online teaching, online learning, instructional design

## Introduction

Massive Online Open Courses (MOOCs) emerged from a vision of free public access to education through the use of very large, open enrollment, online courses (Ferguson, Sharples, & Beale, 2015). The early history of MOOCs saw both excitement and confusion as educators and scholars tried to define, implement, and study this new approach to online education (Moe, 2015). MOOC research to date, though, has largely focused on completion rates (Anderson, Huttenlocher, Kleinberg, & Leskovec, 2014; Jordan, 2014), student learning (Breslow et al., 2013), and/or student engagement (Anderson et al. 2014; Kizilcec, Piech, & Schneider, 2013). While a focus on the student experience is entirely appropriate, seemingly little research has been conducted on the *instructor* experience. Several reviews of MOOC literature have been conducted to identify developing trends and directions for further research (Deng, Benckendorff, & Gannaway, 2017; Ebben & Murphy, 2014; Gasevic, Kovanovic, Joksimovic, & Siemens, 2014; Veletsianos & Shepherdson, 2016). These reviews highlight the gap in the literature about the instructor experience teaching a MOOC. For instance, Deng et al. (2017) reviewed 95 studies on MOOCs. When they found that some researchers had explored “MOOC instructors’ motivations, challenges, and pedagogical preferences,” they pointed out that “this literature is not as well developed as the research on students” (p. 179). Likewise, Veletsianos and Shepherdson (2016) conducted a review of the literature on MOOCs and found that only 8.2% of the 183 studies they reviewed focused on topics related to instructors and teaching; the studies within this category they explained focused primarily on “academics’ awareness, perspectives of, and experience with MOOCs” (p. 214).

The research that has been conducted to date reveals some insights into what it is like to teach a MOOC and how instructors have responded to the experience. Evans and Myrick (2015), for instance, conducted a mixed-method study of professors who had taught a MOOC. They first surveyed 162 professors and then conducted follow-up interviews with five of the professors. Their results indicated that MOOC instructors were experienced faculty members, but had little prior online teaching experience. The instructors enjoyed having access to large numbers of students, but were also challenged by having many students with varying education and cultural backgrounds. They were also divided in their opinions about the purpose of MOOCs or whether students learned as well as they did in face-to-face courses.

Three additional studies involving qualitative interviews of MOOC instructors add more insights into the instructor experience. Haavind and Sistik-Chandler (2015) interviewed eight instructors who taught different kinds of MOOCs. Their findings reveal how instructors struggled with offering personalized and meaningful feedback to large numbers of learners. These instructors also saw themselves in a role that was less like an instructor and more like a “ship commander, leader, or director” (Haavind & Sistik-Chandler, 2015, p. 341). The instructors also described the open access and highly visible nature of the MOOC as a safety concern. In fact, one of the instructors described the experience of being stalked by a student who lived in the same city. In another study, Najafi, Rolheiser, Harrison, and Haklev (2015) interviewed eight University of Toronto instructors who had offered MOOCs through Coursera or edX. They found that the instructors were motivated to provide quality learning experiences to a broad range of students and that the instructors enjoyed contributing open educational resources. Nevertheless, there was a belief among some of the instructors that the MOOC did not provide the same quality of learning as university for-credit courses on the same topic. Another study involving interviews with 14 MOOC instructors was conducted by Zheng, Wisniewski, Rosson, and Carroll (2016). The results of this study

suggest that the process of teaching a MOOC manifests through three stages including preparation of course curriculum, implementation of the course, and feedback to students. Instructors in this study were motivated to engage in the substantial work of teaching a MOOC due to the potential for global impact on students, professional growth, research opportunities, and enhanced name recognition. Zheng et al. (2016) identified five key challenges of teaching a MOOC. They found that instructors struggled with managing collaborative work, balancing the amount of time spent teaching the course, maintaining realistic expectations, dealing with critical students, and overall insufficient support. The results of these studies offer valuable insights, but the research is still limited.

Research suggests that there is a high-quality instructor behind every quality online course (Dunlap, 2005; Wilson, Ludwig-Hardman, Thornam, & Dunlap, 2004). The typical MOOC, however, changes the role of the online instructor (Ross, Sinclair, Knox, Bayne, & Macleod, 2014). As such, it is imperative to learn more about what it is like to teach a MOOC. For instance, do instructors actually enjoy teaching in this format? What have they learned from teaching massive online courses? What has teaching a MOOC taught them about their own pedagogy? If MOOCs are going to be a viable form of learning, and not simply a fad, then MOOC providers need to consider the perspectives and experiences of those who teach these large online courses. The purpose of this study was to better understand the motivation, experience, and perceptions of people who teach massive open online courses.

## Background of the Study

There is not one single type of MOOC. Scholars have tried to categorize different types of MOOCs in order to differentiate some types of MOOCs from other types of MOOCs. For instance, scholars sometimes differentiate MOOCs as being cMOOCs, pMOOCs, or xMOOCs (Bonk, Lee, Reeves, & Reynolds, 2017). cMOOCs are grounded in the theory of connectivism (Siemens, 2005); cMOOCs place the instructor in a co-learner role with students actively constructing and contributing knowledge through an interconnected network of social media, blogs, wikis, and other online communication tools. Another variant is called the pMOOC; the “p” in pMOOC stands for “project” or “problem.” In pMOOCs, instructors serve as a guide while students collaborate to complete a project or address a problem. Then there is the xMOOC. The “x” in xMOOC stands for eXtended (Downes, 2013). xMOOCs position the instructor at the center of the learning experience with an emphasis on didactic instruction through content and videos (Adams, Yin, Madriz, & Mullen, 2014; Bonk et al., 2017). These are not the only types of MOOCs discussed in the literature (e.g., Ballester, 2016; Kim, 2016), but they illustrate how the instructor role shifts depending on the underlying format of the course.

Another shift in the instructor role occurs while designing a MOOC; the massive scale of a MOOC makes it impractical for instructors to work alone as they might when designing other courses. Research suggests that the design and development of MOOCs often requires a team of instructional designers, instructional developers, and subject-matter-experts (Hollands & Tirthali, 2014b). MOOC instructors face multiple challenges, such as heavy workload, substantial time commitment, insufficient support, and lack of compensation, yet many who are faced with these challenges work through them for the opportunity to impact students on a global scale, develop professionally, engage in research, or build name recognition



(Zheng et al., 2016). Additional research, though, is needed to better understand the motivation that drives instructors to take on the formidable task of teaching a MOOC, or continue to teach them after the first one.

We contend that the amount of teaching experience an instructor has—and in particular online teaching experience—is also an important factor when investigating instructors experiences teaching MOOCs. As previously mentioned, Evans and Myrick (2015) found that although many of the instructors in their sample were experienced faculty, most of them had little online teaching experience and were new to teaching MOOCs. Questions remain, though, how the experience of teaching a MOOC, which may be an instructor’s initial foray into online education, impacts instructors overall teaching. For instance, how does teaching online in a large-scale course influence an instructor’s course design and pedagogical decisions? Further research is needed to better understand the impact of MOOC instruction on overall teaching practice.

Finally, questions of instructional quality have been raised in the literature (Lowenthal & Hodges, 2015; Margaryan, Bianco, & Littlejohn, 2015). For example, Margaryan, Bianco, and Littlejohn (2015) identified low instructional design quality in the majority of the 76 randomly selected MOOCs they assessed. Lowenthal and Hodges (2015), though, found that MOOCs had the possibility of meeting similar course quality standards as other online courses. The literature, though, on the instructional quality of MOOCs is lacking an instructor’s perspective. While interviews with MOOC instructors have yielded some initial insights into factors that could impact course quality—such as presentation skills, strong content, managerial skills, personalization, feedback, and student-centered interaction (Haavind & Sisteck-Chandler, 2015), additional research is needed to better understand instructor’s perspectives of the instructional quality of MOOCs.

## Method

The goal of this mixed methods study (Onwuegbuzie & Leech, 2005) was to investigate the motivations, experiences, and perceptions of MOOC instructors. More specifically, the following three groups of questions, derived from cross-cutting themes from prior studies, guided this research:

1. Motivation for Teaching MOOCs.
  - i. Why do people teach MOOCs?
  - ii. What do they expect to gain from teaching a MOOC?
2. MOOC Teaching Experience.
  - i. What have people learned from teaching a MOOC?
  - ii. How has teaching a MOOC impacted their instructional practice?
3. Perception of MOOC Educational Value.

- i. Do they think students learn as much in a MOOC as a traditional online course?
- ii. What are their thoughts about the future of MOOCs?

This study used an explanatory sequential mixed methods research design with data collected during sequential quantitative and qualitative phases (Creswell & Plano Clark, 2011). Data from the quantitative and qualitative phases of the study were merged during an analysis phase to combine them into a more informative whole where qualitative results helped to explain the quantitative findings (Creswell & Plano Clark, 2011; Miles, Huberman, & Saldana, 2014).

MOOC instructors were surveyed during the initial quantitative phase to collect as much information as possible related to the research questions. The sample was drawn from people who have taught a MOOC for Coursera or edX in the past. Similar to Evans and Myric (2015), we focused on Coursera and edX because these two platforms are among the largest and most well-established. At the time of this study, both companies listed past courses on their websites along with instructor information. The survey was sent to 767 instructors; 186 completed it to yield a 24.3% response rate. The survey was intentionally kept short to increase the likelihood that busy instructors would complete it. The survey contained a series of closed-response questions that asked about why they taught a MOOC, their past experience with online and MOOC instruction, and their perceptions of teaching and learning in MOOCs; it also included three open-ended questions focused on what they would do differently if they were to teach another MOOC, how teaching a MOOC has impacted their teaching, and if they had any additional comments. The quantitative results were downloaded and analyzed to generate descriptive statistics.

In the second qualitative phase of the study, a sample of instructors were purposefully selected from those who said they would teach another MOOC and those who would not. These instructors were invited to participate in follow-up interviews. Semi-structured interviews were conducted with 15 MOOC instructors who were asked the following questions:

1. What did you learn from your MOOC experience(s)?
2. What advice would you give a peer who is thinking about teaching a MOOC?
3. Can you explain *how* and *why* (or *why not*) student-to-teacher and student-to-student interaction was used or encouraged in the MOOC(s) you taught?
4. Do you think teaching a MOOC(s), helped your career? Why or why not?
5. What type of incentive (if any) were you provided to teach a MOOC?
6. Should colleges and universities offer college credit to participants for completing a MOOC? Why or why not?
7. Do you think MOOCs will be around in five years? Why or why not?
8. What should we have asked that we didn't?

Transcripts of the recorded interviews and the open-ended survey questions were coded in NVivo 11 Plus for Windows using a multistage process involving a combination of structural, descriptive, and pattern coding (Saldana, 2016). Structural coding was used during an initial reading of the transcripts to organize responses by question while simultaneously becoming familiar with the data set as a whole. Structural coding was used to group responses from each question together for ease of review and comparison. Next, descriptive coding was used to label specific topics discussed in participant responses to each question. Descriptive coding helped to index the topics in the interview responses and label passages of qualitative data with short phrases that captured the essence of their meaning. Finally, pattern coding was used to group similar topics together. In other words, sections of qualitative data coded with similar labels during descriptive coding were grouped together under a higher-level node in NVivo (e.g., all nodes related to motivation). Consistency was promoted through repeated reading, checking, and rechecking of the coding following a process similar to the Constant Comparison approach from Grounded Theory (Glaser & Strauss, 1967). The final step in the analysis was to link the coded qualitative data to the corresponding quantitative results to provide a deeper explanation of the overall findings (Creswell & Plano Clark, 2011; Miles, Huberman, & Saldana, 2014).

## Results

In the following section, results are presented under headings that correspond to the three groups of research questions related to motivation, experience, and perceptions. Findings from quantitative and qualitative phases of the study are merged within each section to present a coherent and informative synthesis of the results. All quotes are from interview transcripts or open-ended survey responses.

### Motivation for Teaching MOOCs

The survey contained a set of statements that asked participants to indicate their reasons for teaching a MOOC (see Table 1). Participants could select any or all statements that applied to them. The number of times each statement was selected is shown in decreasing order of magnitude in Table 1. The most frequently selected set of reason statements (see Table 1, Group 1) would suggest that MOOC instructors were motivated by interest or passion. The second group of statements aligned to publicity or marketing factors such as the push to use MOOCs for advertising and visibility (see Table 1, Group 2). The least selected group of reasons were related to benefits or incentives the instructor might receive when teaching a MOOC (see Table 1, Group 3).

Table 1

*Reasons for Teaching a MOOC*

Reason statements	Number of times selected
<b>Group 1. Interest and Passion</b>	
Interest in the format	136 (73.1%)
Wanted to share knowledge I'm passionate about	130 (69.9%)
Commitment to open education	117 (62.9%)
Personal challenge	114 (61.3%)
Thought I could create a good one	93 (50.0%)
<b>Group 2. Publicity and Marketing</b>	
Branding / advertising purposes	42 (22.6%)
Departmental or institutional pressure	40 (21.5%)
<b>Group 3. Benefits and Incentives</b>	
A means to conduct research	36 (19.4%)
Financial incentive	19 (10.2%)
Received a course release	14 (7.5%)

The follow-up interviews and open-ended survey responses provided additional insights into instructor motivation for teaching MOOCs. The link between quantitative and qualitative findings is illuminated through the organization of key insights from the coded interviews within the framework of the three groups of reason statements in Table 1.

**Interest and passion.** Reasons related to interest and passion were selected more often than other reasons for teaching MOOCs. These reasons emphasized intrinsic motivational factors such as passion, commitment, and the sheer challenge of creating a good MOOC that could be made available to a worldwide audience. Curiosity also played a role as noted by an instructor who stated that the “curiosity of whether it could be done, whether it could be done well, and whether it could be repeated” served as a driving motivating force. Some of the instructors specifically expressed how much they enjoyed the experience of teaching a MOOC and that their involvement was based on factors beyond external incentives. As one instructor pointed out, “I was not provided any incentive other than my own hope that it would extend an awareness of strategies for more effective charitable giving to a larger number of people.” Similarly, another MOOC instructor stated that, “The main reason for doing it was to get the information out to teachers around the world who desperately need it.” MOOCs served as a vehicle through which instructors could share information they were passionate about and to demonstrate new

approaches for teaching. One instructor saw the MOOC as an opportunity to develop an “ideal” course in genetics that would be “accessible to people with a wide range of backgrounds that covers the content that we really ought to be teaching.”

The quotes above indicate interest, passion, and a desire for widespread reach of the MOOCs these instructors were involved in. This finding is in agreement with prior research, which indicates that intrinsic motivational factors were important for MOOC instructors (Zheng et al., 2016).

**Publicity and marketing.** The use of MOOCs for advertising, visibility, or recruitment has served the goals of some institutions of higher education (Hollands & Tirthali, 2014a). There was a perception among some of the participants that institutional interest in using MOOCs for advertising and increased visibility contributed to an agenda that pressed instructors to teach MOOCs. As one instructor noted, “For the universities, this is advertising more than anything else and that's why they're doing it and that's why they'll continue doing it.” Another instructor explained that, “Our university has an agenda to develop online learning. The programs I manage already have minimum 50% online delivery. A goal was for us to increase our visibility as individuals and to increase numbers applying for the programs.”

Instructors also experience greater visibility for their work. One instructor noted that MOOCs are a “good way to publicize the work you’re doing, and raise people’s interest and awareness.” In fact, there may be interweaving strands of institutional and personal branding as an instructor suggested when stating that, “For me, the MOOC was for some extent personal professional branding, and an exploration. It is to some extent an advertisement for our program.”

**Benefits and incentives.** The third, and least selected, group of reasons for teaching a MOOC focused on benefits and incentives such as a means to conduct research, financial incentives, or course release time. The benefit for research is compelling given the large numbers of students to recruit as participants in a study. This was discussed by a MOOC instructor who stated that,

If we had 10,000 people who were willing to do kind of a small exercise, in this case it was on visual perception and game interacting media, we could run an experiment with far greater physical power than anyone had done before, so we did that.

In addition to the potential for research, other incentives included financial support, equipment, personnel, or a reduced teaching load. As one MOOC instructor explained, “The incentive they gave us was that they offered a salary and that they offered support. The salary was not very large, but it was money and for an academic, even small sums are important.” Another instructor stated that, “Well, the school is helping a lot in the sense that I got some money to pay for some equipment that I needed to shoot the videos and so on. They also provided a nice recording studio.” Financial and technical support was an essential consideration as noted by an instructor who said,

If I had to do the whole thing on my own without help I think it would have been a much higher barrier to entry. I got a couple of small grants, and I had a tremendous amount of IT support which to me is really critical.

Unfortunately, incentives were not always available or they were insufficient. This might help to explain why benefits and incentives were the least commonly selected reasons for teaching a MOOC. As one person put it,

I would say that if you looked at the cost by time, I mean our cost was grossly undercompensated for it, just because it was above and beyond our normal duty. We didn't get any course relief. I would say it was the equivalent of maybe teaching a course and a half of normal, and we received maybe one summer month for it.

These findings are in agreement with other research that suggests the importance of offering sufficient resources and support personnel for MOOC instructors (Najafi et al., 2015) and how challenging it can be when resources or support personnel are missing or insufficient (Zheng et al., 2016).

### MOOC Teaching Experience

Several questions from the survey asked participants about their experiences teaching online as well as teaching MOOCs. The majority of the instructors had little (9.7%) to no (45.7%) previous experience teaching online when they taught their first MOOC (see Table 2). Similar results were reported by Evans and Myrick (2015) in their study of MOOC instructors. The combined results from the present study and the previous study by Evans and Myrick (2015) suggest that many of those teaching MOOCs, at least for Coursera and edX, have very little experience teaching online prior to teaching their first MOOC. As one instructor explained, "My MOOC experience was my first foray into online instruction, which has become a big part of what I do since then. Mostly what I learned was, I learned a lot about teaching online."

Table 2

*Online Teaching Experience Prior to Teaching First MOOC*

Level of experience	Number of instructors
None	85 (45.7%)
Little	18 (9.7%)
Some	35 (18.8%)
A Lot	48 (25.8%)

Many of the instructors who participated in this study also had limited experience teaching MOOCs as indicated in Table 3. The majority (81.2%) reported that, at the time of the survey, they had limited experience teaching MOOCs (e.g., one, two, or three courses), but a small percentage (4.3%) had taught a MOOC seven or more times. Furthermore, their experiences teaching MOOCs were varied with some only teaching MOOCs on a set schedule (57.5%), some only teaching MOOCs in a self-paced format (8.6%), and others with experience teaching in both formats (33.9%).

Table 3

*Prior Experience Teaching MOOCs*

<b>Number of MOOCs taught</b>	<b>Number of instructors</b>
1	64 (34.4%)
2	56 (30.1%)
3	31 (16.7%)
4	7 (3.8%)
5	7 (3.8%)
6	5 (2.7%)
7+	8 (4.3%)

*Note.* Eight participants did not respond making total percentages less than 100.

The instructors who participated in the present study reported engagement with various types of MOOC-related experiences as shown in Table 4. Findings reveal that 87.6% took part in designing a MOOC; 74.2% served as the primary instructor of a MOOC; 61.3% served as a Subject Matter Expert (SME), and less than a third had experience taking a MOOC as a learner.

Table 4

*Experience With MOOCs*

<b>Types of experience</b>	<b>Number of instructors</b>
Designed (all or part of) a MOOC	163 (87.6%)
Primary teacher/facilitator of a MOOC	138 (74.2%)
Was involved as subject matter expert (e.g., in recorded lectures) in (all or part of) a MOOC	114 (61.3%)
Served on a team teaching/facilitating a MOOC	91 (48.9%)
Completed part of a MOOC as a learner	55 (29.6%)
Completed all of a MOOC as a learner	25 (13.4%)

Instructor perspectives from interviews and open-ended survey questions helped to illuminate certain aspects of what they learned from their MOOC experiences and how their overall teaching was impacted as a result.

**MOOC course design.** MOOC instructors identified the importance of establishing clear goals, careful planning, and good course design in advance since problems were quickly magnified with large-scale enrollments. Similar concerns have been noted elsewhere (Haavind & Sistik-Chandler, 2015; Zheng et al., 2016) about the potential for high visibility to lead to extreme criticism and reputation risk for MOOC instructors. An instructor reflected that

In a MOOC the students are very good at and very highly motivated to find the errors in your problems. Find the problems with your wording. This question isn't clear. This answer doesn't really make sense. I don't think this grading is fair. A lot of the time the students are actually right.

The downside to advanced planning and up-front course design required for a MOOC was that instructors felt that it was harder to adjust the course while it was in progress (something experienced online educators already have experience with). This was explained by an instructor who stated that,

In a MOOC, you can adjust but it takes a lot longer, so it's not like I can decide, you know what, this coming lecture I'm going to review the basic statistics that I realized people didn't get. You just have to anticipate that more.

In addition to overall course design, MOOC instructors noted certain challenges with course content development or the acquisition of resources. The vision for MOOCs as open access online courses for everyone means that free or open educational resources are an integral component, although this notion has been a contested one (Wiley, 2015). The ideal of using free materials becomes a challenge under certain conditions due to copyright issues and the nature of the course content. One instructor explained how this emerged as a problem:

My particular field is geology and this is a very visual field because we look at rocks, we look at minerals, we use various kinds of maps that we have to look at. It was a challenge for our team to put together this MOOC to find images, suitable images, that illustrated the concepts we were trying to teach and also were available but not copyright protected.

Other instructors were successful in acquiring materials through public domain and Creative Commons repositories, from private holdings where permission for use was granted, or they created their own materials as subject matter experts.

Video presentations were discussed as well. Instructors expressed concerns about the way videos were recorded and how they might be improved. Suggestions included offering variety in the videos beyond the talking head style, making videos shorter and more interactive, test-driving scripts with an audience, speaking slowly, being more relaxed and natural on-camera, having higher quality visuals or animations, and consideration of the global audience when creating the video content. A wide spectrum of approaches were adopted for video production, in agreement with findings from Najafi et al. (2015). Some instructors spent large amounts of time and effort to produce a highly polished product, while others went for a much simpler and basic approach. An elaborate video production process, described by a MOOC instructor, illuminates the potential for taking the process too far.



What we did ended up taking a huge amount of time partly because we were going for the look of a Ken Burns special so I collected thousands of images to put in the videos. We also built a custom set for this thing. We had a three camera set up, one on a boom and all of this stuff. In short, we made it way harder than it really had to be.

In contrast, another instructor described using a much simpler approach to MOOC video production. This instructor explained that, “I didn’t try and make it look like television. It’s more like talking to a student in my office. So I found the editing was really simple. The actual preparing the lectures in terms of recording, was quite easy.” A simpler approach may be suitable under some circumstances, but the desire to “get away from the talking head in recorded lectures” and integrate “different types of visual material” was expressed by some instructors.

**Impact on instructional practice.** The experience of teaching a MOOC had an impact on instructional practice in various ways including organization, assessment practices, consideration of cultural factors, quality control, and pedagogy. Some instructors believed the experience of teaching a MOOC simply made them better teachers by forcing them to work at large scale and in an unfamiliar medium where “the skills of making things more explicit, making things more carefully intelligible, being much more imagistic and image driven” helped their performance in the classroom. A more direct and tangible impact on instructional practice was noted through the use of MOOC course content, techniques, and strategies for other courses. Instructors described using their MOOCs for flipped or blended learning or they repurposed content from the MOOC to supplement other courses. As one instructor put it, “I have incorporated some of the MOOC lecture videos and MOOC-developed exercises into my traditional courses.” The spillover from MOOCs to other courses taught by the instructors is a finding that has received very little attention in prior studies of MOOC instructors (Evans & Myrick, 2015; Haavind & Sisteck-Chandler, 2015; Najafi et al., 2015; Zheng et al., 2016).

Table 5

*Satisfaction With MOOC Teaching Experience*

<b>Statements</b>	<b>MOOC instructor ratings</b>					<b>M</b>	<b>SD</b>
	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>		
I enjoy teaching MOOCs.	4	8	17	84	73	4.15	0.91
I would teach a MOOC again.	4	9	18	71	84	4.19	0.95
Every teacher should teach a MOOC at least once.	30	50	66	25	15	2.70	1.14
Teaching a MOOC is more work than teaching a traditional asynchronous online course. <sup>a</sup>	5	26	54	44	53	3.63	1.13

*Note.* 1 = Strongly Disagree, 2 = Disagree, 3 = Neither Agree or Disagree, 4 = Agree, 5 = Strongly Agree. Numbers under each rating indicate a count of survey respondents.

<sup>a</sup> Four participants did not respond to this question.

**Overall satisfaction.** The statements listed in Table 5 were rated by the MOOC instructors who completed the survey. This group of statements illuminate overall satisfaction instructors had with their MOOC teaching experiences. Mean ratings for the first two statements are similar for their enjoyment of teaching MOOCs ( $M=4.15$ ) and their willingness to teach another ( $M=4.19$ ). Reasons for these positive ratings are found in the qualitative data from interviews and open-ended survey responses. One instructor who was very positive about the experience put it this way:

I enjoyed the process of making it even though as I said it was a lot more work than I expected. I've enjoyed the process of teaching it even though my involvement in the actual day to day workings of the course has been minimal while it's been in progress. I have really enjoyed reading the discussion posts and the slides our community TAs and seeing the depths and the interests that the students can bring to a course like this. It's gratifying to know that there are people who are appreciating all the hard work that we've put into making this a good course.

**Advice for new MOOC instructors.** Despite the positive responses about teaching a MOOC, instructors had a less favorable opinion about the idea of every instructor teaching a MOOC at least once as indicated by the mean rating of 2.70 in Table 5. Reasons for this finding were indicated by the advice instructors offered for those who might be considering teaching a MOOC. Suggestions included being clear about the purpose and reasons for teaching a MOOC, getting compensation and workload plans in place early in the process, obtaining adequate support (e.g., technical support, teaching assistants), resolving intellectual property issues, becoming familiar with the technology, gaining support from administration or other faculty members, and developing reasonable expectations for what can be accomplished on a massive scale with respect to assessment, instructional strategies, or interaction with students. Similar issues were previously identified as key challenges for MOOC instructors (Zheng et al., 2016).

### **Perception of MOOC Educational Value**

The majority of instructors (83%) believed that the MOOC they taught provided a high-quality learning experience (see Table 6). At the same time, almost 38% neither agreed nor disagreed that MOOCs are the future of online learning. While more than half (56%) thought that MOOCs were as good as traditional asynchronous courses, 45% disagreed that MOOCs were as good as traditional face-to-face courses.

Table 6

*Perceptions of Educational Value*

Statements	MOOC instructor ratings					M	SD
	1	2	3	4	5		
MOOC(s) I taught offered a high quality learning experience.	4	5	20	91	66	4.13	0.87
MOOCs can be as good as traditional asynchronous online courses <sup>a</sup> .	4	22	51	67	39	3.63	1.02
MOOCs can be as good as traditional face-to-face courses <sup>b</sup> .	23	62	55	27	16	2.73	1.13
Future of online learning is MOOCs <sup>c</sup> .	20	40	72	40	10	2.89	1.05

*Note.* 1 = Strongly Disagree, 2 = Disagree, 3 = Neither Agree or Disagree, 4 = Agree, 5 = Strongly Agree. Numbers under each rating indicate a count of survey respondents.

<sup>a,b</sup> Three participants did not respond to this question. <sup>c</sup> Four participants did not respond to this question.

**Perceptions of MOOC quality.** Course quality is a complex topic, but the large-scale of a MOOC introduces unique challenges that impact both the instructor and student experience. One obvious challenge is the difficulty of providing individual feedback to large numbers of students. In a MOOC, feedback can come from interaction with course quizzes, from TAs (teaching assistants), other students, or to a lesser degree from the instructor (Haavind & Sistek-Chandler, 2015). Much of the person-to-person interaction occurs in discussion forums, which can quickly become overwhelming when there are thousands of participants. Participants in the present study described how they or their teaching assistants (when available) tried to interact with some of the students on the discussion forums, but they also tried strategies such as virtual office hours, weekly announcements, feedback to a few selected students, or by answering student questions in newly-created videos that were integrated as the course progressed.

Assessment of student work was another area made difficult by the scale of a MOOC. Typical assessment strategies included using quizzes or some form of peer assessment for open-ended student work such as writing or media projects. As one MOOC instructor noted, peer review was essential for assessing student writing given that they “had something like 60,000 learners enrolled by the end of the course.” Yet, peer review was deemed somewhat limited since it depended on committed student volunteers. These findings are consistent with other studies that spoke to the assessment practices of MOOC instructors (Evans & Myrick, 2015; Haavind & Sistek-Chandler, 2015; Najafi et al., 2015).

**Perceptions of the future of MOOCs.** Instructor perceptions of the future of MOOCs have received little attention in previous research. Instructors in the present study offered several reasons for why they thought MOOCs would likely continue. Among these reasons were the attractiveness of learning

on demand, the opportunity to reach large numbers of learners, and the ability to make a variety of courses available to a wide variety of people. One MOOC instructor put it this way,

There are folks out there who want to learn and MOOCs are free and open for them and available, then they'll be here 5 years, 10 years. I find that very exciting. I love the idea that there are individuals who aren't necessarily affiliated with a university and maybe already had university degrees themselves that are still so interested in learning about these various subjects that they're willing to take a course. I think that human motivation, personal motivation will keep MOOCs alive.

Nevertheless, respondents expressed concerns regarding the financial sustainability of MOOCs and the longevity of free versus for-profit MOOCs. One respondent suggested that certain types of MOOCs, such as those that are designed for professional certification, might have potential profitability as opposed to some other types of MOOCs. Several challenges were described including how to handle student fees, how to deal with transfer credits, and how to ensure that MOOCs are robust enough to be worthy of college credit. Instructors reported that these issues should be addressed to help ensure the longevity of MOOCs.

## Conclusion

The findings from this study both support and expand on the small body of literature about MOOC instructor experiences and perspectives of teaching MOOCs. Questions related to motivation sought to explore why someone might take on the task of teaching an open large-scale online course. A key finding was that MOOC instructors have been primarily motivated for intrinsic reasons (e.g., worldwide impact on students) rather than extrinsic incentives (e.g., money or course release). However, the need for support is critical and not consistently available for MOOC instructors.

Instructors who participated in this study tended to have little prior experience teaching online prior to teaching their first MOOC, which suggests that they learned the basics of online teaching while teaching a large-enrollment course. The implications of this are that online pedagogy, or thoughts about what online teaching entails, may be shaped by their MOOC teaching experience. The findings support this, since instructors discussed how teaching a MOOC caused them to reflect on how they teach their face-to-face courses as well as how they might use course materials developed for their MOOCs with other courses in a synergistic fashion.

Perceptions of MOOC quality were primarily good when instructors were asked about their own courses. However, when asked about how the MOOCs compared to other online teaching and especially face-to-face instruction, participants did not rate them as highly. Reasons for this can be attributed to the large scale of the MOOC and the challenges of providing feedback to students or individualized assessment.

This study was limited to instructors who were teaching on edX and Coursera platforms. Additional research could expand to multiple platforms and cover a greater variety of MOOC types. Longitudinal research may help to explore instructor perceptions over time as MOOCs continue to evolve and instructors gain more experience teaching in this format.

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July – 2018

## Grit and Intention: Why Do Learners Complete MOOCs?

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### Abstract

In recent years there has been considerable interest in how many learners complete MOOCs, and what factors during usage can predict completion. Others, however, have argued that many learners never intend to complete MOOCs, and take MOOCs for other reasons. There has been qualitative research into why learners take MOOCs, but the link between learner goals and completion has not been fully established. In this paper, we study the relationship between learner intention to complete a MOOC and their actual completion status. We compare that relationship to the degree to which MOOC completion is predicted by other domain-general motivational factors such as *grit*, *goal orientation*, *academic efficacy*, and the *need for cognition*. We find that grit and goal orientation are associated with course completion, with grit predicting course completion independently from intention to complete, and with comparable strength.

*Keywords:* massive open online courses (MOOCs), online learning, learner motivation, learning analytics, grit

## Introduction

Massive open online courses (MOOCs) have gained considerable popularity in a relatively short time frame. Not all learners complete the MOOCs they start (DeWaard et al., 2011; Jordan, 2014; Knox, 2014; Pappano, 2012), yet MOOC completion has become an important addition to many learners' academic careers or professional development. A MOOC certificate can be a valuable step to earning course credits and credentials (Hyman, 2012). Furthermore, completing a MOOC can be beneficial towards eventually joining a scientific community of practice (Wang, Paquette, & Baker, 2014).

However, not all MOOC learners seem to be interested in completing the courses in which they enroll; many learners use MOOCs in more selective fashions, focusing on more specific sub-sets of the content and learning experience (Ho et al., 2014). It appears that learners approach MOOCs with a variety of goals and intentions (Breslow et al., 2013). Past MOOC learner motivation studies have analyzed the diverse range of motivation that MOOC learners bring to their studies. Kizilcec, Piech, and Schneider (2013) categorized MOOC learners into four groups based on their behavior: (1) completing; (2) auditing; (3) disengaging; and (4) sampling. Alternatively, Clow (2013) suggested that there is a "funnel of participation" with multiple levels of participation; the deeper the participation, the smaller the number of MOOC learners who reach that depth of participation. Although it is worth noting that many MOOC learners who do not complete or interact with the platform instead download course videos and study on their own (Kahan, Soffer, & Nachmias, 2017), suggesting that some learners may be more engaged with course materials than their in-platform behaviors seem to indicate.

Researchers have also explored various reasons behind the steep dropout rates among MOOC learners (e.g., Halawa, Greene, & Mitchell, 2014; Kizilcec, Pérez-Sanagustín, & Maldonado, 2017). For example, Alario-Hoyos, Estévez-Ayres, Pérez-Sanagustín, Kloos, and Fernández-Panadero (2017) examined the relationship between learner motivation and types of learning strategies and found out that MOOC learners, although often highly motivated in terms of both possessing intrinsic goals and high task value, may benefit from improved time management skills, especially given that MOOCs lack personalized support and instructor attention (Hood, Littlejohn, & Milligan, 2015).

More specific attention has also been given toward analyzing the types of motivation of MOOC learners who are working professionals (Milligan & Littlejohn, 2017). Their study identified that the majority of working professionals expressed that their interests lie in learning the course content to fill in their current skills gap and that these learners did not put course completion as their primary goal.

While these analyses showed that MOOC learners participate to varying degrees, they did not investigate whether the nonparticipating learners intended to complete the course at its outset. If a learner does not intend to complete the course, as with many of the learners in (Milligan & Littlejohn, 2017), perhaps their behavior should be interpreted differently. If a learner intended to complete the course, it is relevant to consider whether they actually did—and what factors lead some learners not to complete courses they planned at the outset to complete. Correspondingly, one can also ask if any learners in fact complete courses despite not initially intending to?

We can perhaps better understand the role played by learner intention, by comparing it to other learner goals and motivations. While research has shown that MOOC learners are often strongly internally motivated (Bonk & Lee, 2017), it has not yet shown which types of motivation play the largest role in either learner intent or outcomes. To investigate this, we can draw from the extensive literature on learner goals and motivation in other contexts. There have been MOOC studies that have examined domain-specific motivational concepts, such as whether the MOOC is relevant to the learner's academic field of study (e.g., Belanger & Thornton, 2013). Research in other domains has shown the important role of more cross-cutting aspects of motivation in driving participation and performance. For example, learning goals were shown to be associated with successful performance in traditional classroom settings (Pintrich, 2000). Learners with performance-approach goals may strive to outperform others; these goals were found to be positive predictors of exam performance. Conversely, learners with performance-avoidance goals may aim to avoid performing more poorly than others (Murayama, Elliot, & Yamagata, 2011). These goals were found to be associated with poorer performance (Elliot, McGregor, & Gable, 1999). Student motivation may also influence how they participate not just in the MOOC itself but in social media surrounding that MOOC (Sie et al., 2013).

Another important motivational construct—*self-efficacy*—has also been found to correlate with performance, for instance in mathematics (Hackett & Betz, 1989). Self-efficacy also predicts engagement within some online learning contexts (e.g., Eservel, 2014). *Need for cognition* (NFC) the extent to which individuals are inclined towards effortful cognitive activities, has also been found to positively relate to academic performance (Sadowski & Gülgös, 1996). More recently, *grit* has been found to predict retention in various contexts including school, workplace, and military (Eskreis-Winkler, Shulman, Beal, & Duckworth, 2014). These relationships have been insufficiently studied in the context of MOOCs. Studying the relationship between these variables and course completion may help us to understand the role that goal orientation and self-efficacy play in driving learner participation within MOOCs.

As such, the research in this paper attempts to investigate learner goals and motivations such as grit, goal orientation, academic efficacy, and NFC in the context of a MOOC, and in particular how these factors relate with and compare to the learner's own intention and plan to complete the MOOC. Specifically, the present study aims to answer the following questions: (1) How do initial learner intentions relate to subsequent course completion? and (2) How do other learner goals and motivational factors relate to subsequent course completion? Questions (1) and (2) lead to a third question: (3) How do these factors interact to produce a learner's choices which lead to completing a course and earning a certificate?

## Background

In the present study, we investigate three sets of variables: *learner intention, motivation and goals*, and *MOOC completion*. We first looked at the relation between learner intention and course completion; then we analyzed how motivational aspects relate to intention and completion, respectively. To guide the present study, we review related theoretical and empirical studies in two sections: Section 1 — Intention; and Section 2 — Four Motivational Variables Potentially Related to MOOC Completion: Goal Orientation, Self-efficacy, Grit, and NFC.

## Intention

According to the theory of planned behavior, intentions are the most important predictor of behavior (Ajzen, 1985, 1991). In this case, we are interested in whether the learner completes the MOOC they start. However, people may have incomplete control over whether they can engage in the behaviors they intend (Sheeran, 2002).

To study the gap between intention and behavior, McBroom and Reid (1992) decomposed the consistency and discrepancy between intentions and subsequent actions into four categories (McBroom & Reid, 1992). Learners termed *inclined actors* intend to act and actually do so. Learners termed *disinclined abstainers* do not intend to act and indeed do not. These two groups of learners are consistent in their behavior. *Inclined abstainers* (who intend to act but fail to do so) and *disinclined actors* (who do not intend to act but actually do) can be seen as having behavior that is discrepant from their actions (Orbell & Sheeran, 1998). Sheeran (2002) conducted a meta-analysis and found that inclined abstainers are considerably more common than disinclined actors across contexts. The existence of a discrepancy between intention and behavior indicates that intention is not the only factor that influences subsequent behavior. Motivation has long been held to be a critical factor affecting the relationship between intention and behavior (Ajzen & Fishbein, 1974). Therefore, in the present study, we investigate how learner intention interacts with various aspects of motivation.

## Four Motivational Variables Potentially Related to MOOC Completion: Goal Orientation, Self-efficacy, Grit, and NFC

**Grit.** Grit refers to “perseverance and passion for long-term goals” (Duckworth, Peterson, Matthews, & Kelly, 2007, p. 1087). Studies have shown that grit is associated with achievement motivation (Duckworth & Eskreis-Winkler, 2013), educational attainment (Duckworth & Quinn, 2009), and professional achievement (e.g., Vallerand, Houlfort, & Forest, 2014). Grit also predicts retention in a challenging 3-week military training course (Eskreis-Winkler et al., 2014). Grit has not yet been widely studied in the context of MOOCs. One study investigated grit within MOOC learners who were currently enrolled in college, finding among male learners that grit was associated with the plan to graduate from college (Cupitt & Golshan, 2015); however, this research did not investigate the relationship between grit and MOOC completion. Another study (Hicks & Klemmer, 2016) employed the Grit Scale (Duckworth & Quinn, 2009) as one component in constructing a learning-belief scale to assess MOOC learners; no analysis was, however, conducted on grit alone. As such, it remains an open question how grit affects retention in the context of MOOCs.

**Academic efficacy.** A second important motivational factor is self-efficacy, defined as one’s belief that one can accomplish a given task (Bandura, 1994). Zimmerman, Bandura, and Martinez-Pons (1992) found evidence that a learner’s self-efficacy is associated with learning achievement. A specific category of self-efficacy is academic efficacy: self-efficacy focused on academic situations (Ryan, Gheen, & Midgley, 1998; Pintrich & Schunk, 1996). In the context of MOOCs, a previous study (Wang & Baker, 2015) found little evidence for difference in generalized academic efficacy between MOOC completers and noncompleters, but they found evidence that MOOC completers had higher self-efficacy in completing the current MOOC prior to the start of the course.

**Goal orientation.** There is a long history of research into learner motivation in education (cf. Ames & Archer, 1988; Ames, 1992). One of the most popular theoretical frameworks for learner motivation over the last three decades has been the study of learner goals, or goal orientation (Elliot & Harackiewicz, 1994). Dweck (1986) argued that two key goals characterize most learners: (1) learning goals (also called mastery goals); and (2) performance goals. Learners with learning goals strive to increase their competence and master skills (Ames & Archer, 1987); learners with performance goals strive to succeed and obtain favorable assessments from others. In the context of MOOCs, a previous study (Wang & Baker, 2015) found little evidence for the difference in goal orientation between MOOC completers and noncompleters. We investigate in this study whether this finding can be replicated and how it connects to learner intention.

**Need for cognition (NFC).** NFC indicates a stable tendency to engage in and enjoy effortful cognitive activity (Cacioppo & Petty, 1982). MOOCs may represent this effortful activity for many learners. Several past studies have shown that NFC predicts learners' academic achievement (e.g., Sadowski & Gülgöz, 1996; Elias & Loomis, 2002). NFC has been found to be positively related to goal-oriented behavior (Fleischhauer et al., 2010). Moreover, NFC was found to be positively associated with the experience of flow in human-computer interactions (Li & Browne, 2006). Overall, NFC has been studied most thoroughly in off-line learning contexts (Evans, Kirby, & Fabrigar, 2003), though there has been some research in the context of computer-assisted learning contexts (e.g., Li & Browne, 2006). To the best of our knowledge, this construct has not been studied in the context of MOOCs.

## Method

We collected pre-course survey measures including learner intention types and various motivational aspects, as well as learner course completion statuses. We then conducted two sets of comparisons. The first set looked into how learners with different intention types differ regarding their motivational survey responses; the second set investigated how course completers and noncompleters differ regarding their motivational survey responses.

### Data Sources

We researched the proposed questions within the context of the second iteration of the Big Data in Education Course (BDEMOOC), developed by Teachers College, Columbia University via the edX MOOC platform. BDEMOOC's second iteration began on July 1, 2015. It officially ended on August 26, 2015, but the course remained open after that point. A survey was distributed to learners through the course e-mail messaging system to learners who enrolled in the course prior to the course start date. Completion was predefined in the syllabus as the equivalent of earning a certificate. Therefore, in the present paper, *intention to completion* and *intention to earn a certificate* are interchangeable. While a verified certificate was available for a fee, an unofficial certificate was available for free.

This MOOC was comprised of 8 weeks of video lectures, discussion forums, and a set of 8 assignments (completed weekly). The videos taught learners key methods for analyzing large-scale educational data. Some of the videos contained in-video quizzes that did not count toward the final grade. In each assignment,

learners were asked to conduct an analysis of a data set provided to them (typically genuine data from educational settings) and answer step-by-step questions about the results of their analysis.

The 8 weekly assignments incorporated on-demand hints and instant feedback delivered through the Cognitive Tutor Authoring Tool (CTAT) integrated with edX through Learning Tools Interoperability (LTI) integration (Aleven, McLaren, Sewall, & Koedinger, 2009). All the weekly assignments involved numeric input or multiple-choice questions and were automatically graded. Assignments had automated messages that were given when learner input reflected a known misconception or error, and each step of the assignments had on-demand hint messages that explained the process to the learner (Aleven et al., 2015). A set of 8 weekly collaborative chat activities were delivered through the Bazaar tool (Adamson, Dyke, Jang, & Rosé, 2014). The Bazaar tool provides a chat environment that matches learners into discussion groups guided by a virtual agent. However, due to technical glitches, the activities in the Bazaar tool were not graded, and this policy shift was announced early in the course.

## Participants

The course had a total enrollment of 10,348 students from 162 countries during its official run as a course. During the first week of the course, 2,538 learners visited at least one page of course content, and 1,212 learners played at least one video. There were 510 learners who posted at least one comment in the discussion forum during the course. The course data showed that 251 out of the 2,548 learners who visited at least one page of course content completed at least one assignment, and that 116 learners in total completed the online course and received a certificate.

## Completion

Completion was also coded as a dichotomous variable, where 1 = certificate earners and 0 = noncertificate earners. The requirement for earning a certificate in the BDEMOOC was predefined as earning an overall grade average of 70% or above. The overall grade was calculated by averaging the learner's 6 highest grades out of a total of 8 assignments.

## Motivational Survey

To measure MOOC learner motivation, the precourse survey incorporated three sets of questions:

- The short 8-item Grit Scale (Duckworth & Quinn, 2009; Duckworth et al., 2007).
- Three subscales of the Patterns of Adaptive Learning Survey (PALS): academic efficacy scale, mastery-goal orientation scale, and performance-goal orientation scale (Midgley et al., 2000)
- The 18-item NFC Scale (Cacioppo & Petty, 1982)

On the first day of the course, all enrolled learners received an e-mail with a link to participate in the precourse survey. This survey received 2,792 responses; 38% of the respondents were female and 62% of the respondents were male. All survey respondents were 18 years of age or older; 9% were between 18 to 24 years, 38% were between 25 to 34 years, 26% were between 35 to 44 years, 17% were between 45 to 54 years, 8% were between 55 to 64 years, and 1% were 65 years or older. This indicates a learner profile not too dissimilar to the graduate learner populations taking more traditional online courses. Respondents were

not required to complete any items in the survey and, as such, different numbers of students completed each instrument: 256 respondents completed the entire Grit Scale; 491 respondents completed the entire academic efficacy scale; 625 respondents completed the entire mastery-goal orientation scale; 417 respondents completed the entire performance-goal orientation scale; and 213 respondents completed the entire NFC Scale; 1,116 respondents responded to the question regarding their completion intentions.

**Enrollment intention.** Upon entering the precourse survey, we asked learners to indicate whether they intended to earn a certificate or not. Enrollment intention was coded as a dichotomous variable, where 1 = certificate intenders and 0 = noncertificate intenders.

**The Grit Scale.** The present study included the 8-item short Grit Scale (Duckworth & Quinn, 2009) to assess learner' consistency of interests and perseverance of efforts. *Consistency of interests* was measured by items such as "New ideas and projects sometimes distract me from previous ones"—a reverse-coded item—while *perseverance of efforts* was measured by items such as "I'm a hard worker." The grit scores were calculated by averaging across items on a scale of 1 to 5. Higher scores indicate more grit.

**Three PALS subscales: Academic efficacy, mastery-goal orientation, and performance-goal orientation.** Three PALS (Midgley et al., 2000) scales measuring mastery-goal orientation and academic efficacy were used to study standard motivational constructs. PALS scales have been widely used to investigate the relation between a learning environment and a learner's motivation (cf. Clayton, Blumberg, & Auld, 2010; Meece, Anderman, & Anderman, 2006; Ryan & Patrick, 2001). For the present study, three subscales measuring academic efficacy, mastery-goal orientation, and performance-goal orientation were included to investigate the differences between MOOC course completers and noncompleters. In total, fifteen items (five in each scale), scaled 1 to 5, were included. Scores for measuring academic efficacy, mastery-goal orientation, and performance-goal orientation were computed by averaging across the 5 items under each subscale.

**The NFC Scale.** The 18-item NFC Scale has been widely used as a motivational factor in hundreds of empirical studies of effortful cognitive endeavors (Cacioppo, Petty, Feinstein, & Jarvis, 1996). The NFC Scale scores were computed by averaging across all 18 items, on a scale of 1 to 5. Higher scores indicate more NFC.

## Analysis

After survey data collection, data on course completion was merged with the survey data. We studied the relationship between certificate intention and certificate completion. Two sets of independent *t* tests were conducted to compare in terms of the five motivational variables, grit, academic efficacy, two types of goal orientation, as well as NFC listed above (1) certificate intenders and noncertificate intenders and (2) certificate earners and noncertificate earners.

As this investigation comprises 10 statistical analyses across two groups, we controlled for multiple comparisons, using Benjamini and Hochberg's (1995) false discovery rate (FDR) method. FDR methods attempt to adjust the degree of conservatism across tests so that 5% of significant tests are false positives, instead of attempting to validate that each test individually has less than a 5% chance of being a false positive, given other tests. This ensures a low overall proportion of false positives, while avoiding the

substantial overconservatism found in methods such as the Bonferroni correction (see Perneger, 1998 for a review of the criticisms of the Bonferroni correction).

In this study, two levels of baseline statistical significance ( $\alpha = .05$  or  $.1$ ) for the Benjamini & Hochberg (B & H) adjustment were used. The  $.05$  level suggests full statistical significance, while  $.1$  indicates marginal significance. In the B & H adjustment, each test retains its original statistical significance, and the adjusted  $\alpha$  value cutoff for significance changes depending on the order of test significance. Adjusted  $\alpha$  value cutoffs are given in tables in the following section.

## Results

### Intention and Completion

A chi-square test of independence was performed to examine the relation between intention to earn a certificate and actual certificate attainment. The relationship between these two variables was significant— $\chi^2(1, N = 1232) = 7.879, p < .01$ —indicating that intention is associated with completion. This result is consistent with our hypothesis that learners who intend to complete the course are more likely to actually complete the course.

Table 1

*Results of Chi-square Test Between Types of Learner Intention and Course Completion*

	Noncertificate earners	Certificate earners
Noncertificate intenders	894 (72.6%)	80 (6.5%)
Certificate intenders	222 (18.0%)	36 (2.9%)

*Note.*  $\chi^2 = 7.879, df = 1. *p < .01$

Of the 20.9% of learners who intended to complete the course 14.0% actually completed the course and 86.0% did not complete the course. Of the 79.1% of learners who did not intend to complete the course 8.2% actually completed the course and the remaining 91.8% did not complete the course.

### Comparison Between Certificate Intenders and Nonintenders on Motivational Factors

Academic efficacy, mastery-goal orientation, and performance-goal orientation were found to be statistically significantly different between certificate intenders and noncertificate intenders. Among the five motivational factors, three out of five were found to be statistically significant:



(1) academic efficacy:  $t(489) = 3.048, p = .003$  ( $\alpha = .015$ ),  $d = .238$ ; (2) mastery-goal orientation:  $t(623) = 6.826, p < .0001$  ( $\alpha = .0005$ ),  $d = .503$ ; and (3) Performance-Goal Orientation:  $t(415) = 3.824, p < .001$  ( $\alpha = .01$ ),  $d = .307$ .

The degrees of freedom varied test-by-test depending on the number of subjects who answered the items on each scale. It is interesting to see that certificate intenders are more likely to be both mastery-goal oriented and performance-goal oriented. Since intention was measured at the beginning of the course, one possible interpretation is that learners who intend to earn a certificate are interested in both learning the content of then course and in proving their competency with the content.

Grit ( $t[254] = 1.476, p = .141$  [ $\alpha = .035$ ],  $d = .191$ ) and NFC ( $t[211] = -.605, p = .546$  [ $\alpha = .045$ ],  $d = .088$ ) were not statistically significantly different between learners who intended to obtain a certificate and learners who did not intend to obtain a certificate. It appears that grit is not strongly associated with one's intention of intended future achievement but more associated with the actual achievement. This may suggest that grit has an impact on a persistence that the learners themselves are not fully aware of, driving the learner to almost compulsively complete tasks they begin even when they do not initially intend to.

Table 2

*Comparison of Motivational Scales Between Certificate Intenders and Noncertificate Intenders*

Survey items	Certificate intention		t test, p value ( $\alpha$ level adjusted)
	No	Yes	
Grit	$M = 3.168,$ $SD = .378$	$M = 3.236,$ $SD = .335$	$t(254) = 1.476,$ $p = .141$ ( $\alpha = .035$ )
Academic Efficacy	$M = 3.952,$ $SD = .797$	$M = 4.139,$ $SD = .776$	$t(489) = 3.048,$ <b>**p = .003</b> ( $\alpha = .015$ )
Mastery-Goal Orientation	$M = 3.963,$ $SD = .856$	$M = 4.345,$ $SD = .648$	$t(623) = 6.826,$ <b>**p &lt; .0001</b> ( $\alpha = .0005$ )
Performance-Goal Orientation	$M = 1.804,$ $SD = .966$	$M = 2.128,$ $SD = 1.136$	$t(415) = 3.824,$ <b>**p &lt; .001</b> ( $\alpha = .01$ )
NFC	$M = 4.039,$ $SD = .591$	$M = 3.985,$ $SD = .637$	$t(211) = -.605,$ $p = .605$ ( $\alpha = .045$ )

*Note.* Boldface indicates items with statistically significant relationship between these two groups. Significant: **\*\*p** < adjusted  $\alpha$ . Marginally significant: \*p < adjusted  $\alpha$  \*2.

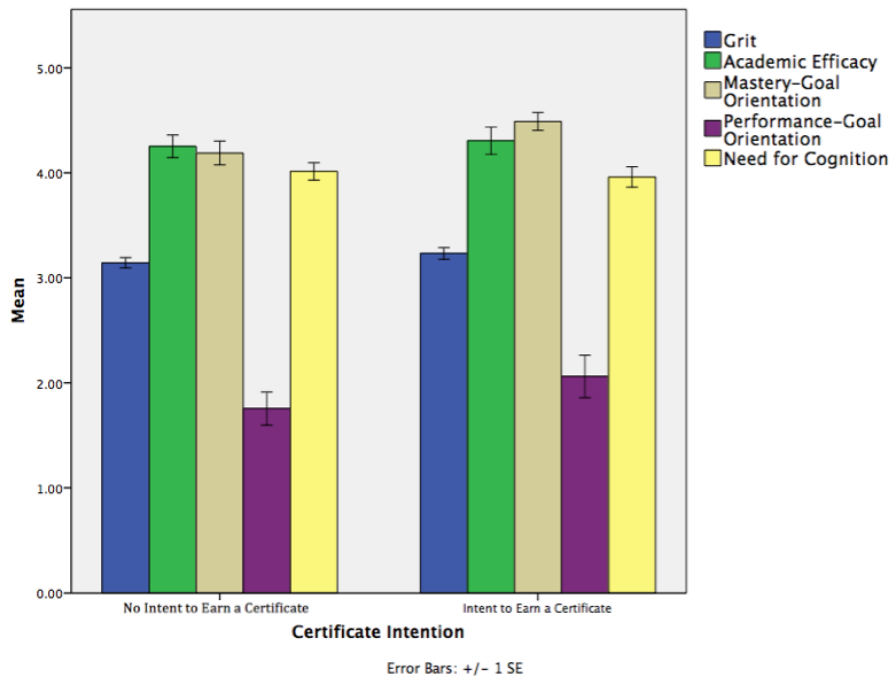


Figure 1. Mean differences of motivational factors between learners who intended to earn a certificate and those who did not.

### Comparison Between Certificate Earners and Noncertificate Earners on Motivational Factors

Both grit ( $t[254] = 2.005, p = .046 [\alpha = .03]$ ) and mastery-goal orientation ( $t[145] = 1.435, *p = .039 [\alpha = .025], d = .307$ ) were marginally significantly associated with obtaining a certificate with a moderately large effect size ( $d = .528$ ), while performance-goal orientation ( $t[145] = -1.038, **p = .005 [\alpha = .02], d = .369$ ) was statistically significantly associated with obtaining a certificate. Specifically, certificate earners scored higher on grit and mastery-goal orientation but lower on performance-goal orientation. Academic efficacy ( $t[142] = -1.751, p = .144 [\alpha = .04], d = .212$ ) and NFC ( $t[26] = -1.540, p = .605 [\alpha = .05], d = .122$ ) did not show statistically-significant differences between learners who completed the course and those who did not. This set of findings are consistent with past literature: grittier learners are more likely to earn a certificate and mastery-goal orientated learners are more likely to earn a certificate whereas performance-goal oriented students are less likely to earn a certificate.

Table 3

*Comparison of Motivational Scales Between Certificate Earners and Noncertificate Earners*

Survey items	Earned a certificate?		t test, p value ( $\alpha$ level adjusted )
	No	Yes	
Grit	<b><i>M</i> = 3.184,</b> <b><i>SD</i> = .364</b>	<b><i>M</i> = 3.355,</b> <b><i>SD</i> = .277</b>	<b><i>t</i>(254) = 2.005,</b> <b>*<i>p</i> = .046 (<math>\alpha</math> = .03)</b>
Academic efficacy	<i>M</i> = 4.025, <i>SD</i> = .794	<i>M</i> = 3.858, <i>SD</i> = .794	<i>t</i> (142) = -1.751, <i>p</i> = .144 ( $\alpha$ = .04)
Mastery-goal orientation	<b><i>M</i> = 4.071,</b> <b><i>SD</i> = .818</b>	<b><i>M</i> = 4.309,</b> <b><i>SD</i> = .729</b>	<b><i>t</i>(145) = 1.435,</b> <b>*<i>p</i> = .039 (<math>\alpha</math> = .025)</b>
Performance-Goal Orientation	<i>M</i> = 1.934, <i>SD</i> = 1.044	<i>M</i> = 1.585, <i>SD</i> = .835	<i>t</i> (145) = -1.038, <b>**<i>p</i> = .005 (<math>\alpha</math> = .02)</b>
NFC	<i>M</i> = 4.027, <i>SD</i> = .599	<i>M</i> = 3.948, <i>SD</i> = .692	<i>t</i> (26) = -1.540, <i>p</i> = .605 ( $\alpha$ = .05)

*Note.* Boldface indicates items with statistically significant between these two groups. Significant: \*\*  $p < \text{adjusted } \alpha$ . Marginally significant: \*  $p < \text{adjusted } \alpha * 2$ .

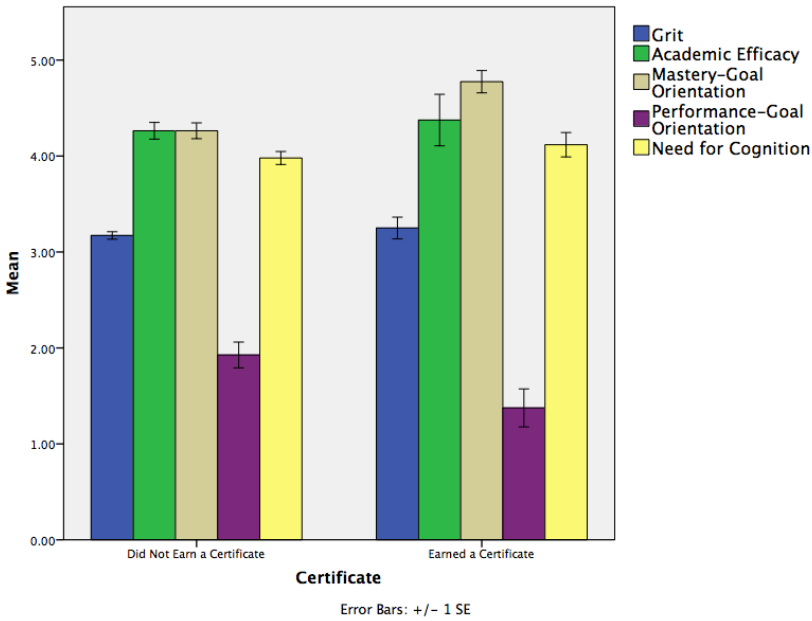


Figure 2. Mean differences of motivational factors between those who earned a certificate and those who did not.

### Grit and Earning a Certificate

As a follow-up, three logistic regression analyses were conducted to test whether grit, mastery-goal orientation, and performance-goal orientation can individually predict if a learner earns a certificate or not while controlling learner intention.

For the first logistic regression analysis (Table 4, below), a test of the full model against a constant-only model was statistically significant ( $\chi^2[2] = 7.676, p = .022$ ) indicating that grit scores and intention types together as a set distinguished between learners who earned a certificate and those who did not. The Wald test results showed that grit ( $\chi^2[1] = 3.481, p = .062$ ) and intention types ( $\chi^2 [1] = 3.272, p = .070$ ) were individually each marginally statistically significant and positively associated with obtaining a certificate within the combined model. Their strength of association was approximately the same, but the magnitude of effect, shown by the *B* coefficients, was larger for grit than certificate intent. This result indicates that, among learners who intend to earn a certificate, grittier learners are still more likely to finally earn a certificate, in line with initial expectations.

Table 4

*Logistic Regression Analysis of Earning a Certificate or Not from Grit and Intention Types*

Covariates	<i>B</i>	<i>SE</i>	Wald	<i>df</i>	<i>p</i> value	Exp( <i>B</i> )
Grit	1.410	.756	3.481	1	<b>.062</b>	4.096
Certificate intent	.900	.498	3.272	1	<b>.070</b>	2.460
Constant	-7.603	2.547	8.913	1	.003	.000

For the second logistic regression analysis (Table 5, below) looking into how mastery-goal orientation and intention types relate to earning a certificate or not, a test of the full model against a constant only model was statistically significant ( $\chi^2[2] = 30.738, p < .001$ ) indicating that mastery-goal orientation and intention types together as a set distinguished between learners who earned a certificate and those who did not. The Wald test results showed that mastery-goal orientation was not statistically significant within the combined model ( $\chi^2[1] = .854, p = .355$ ) while intention type was statistically significant and positively associated with obtaining a certificate within the combined model,  $\chi^2[1] = 23.971, p < .001$ . This result is expected since the majority of the MOOC learners can be expected to be interested in the content of the course (few learners take an advanced MOOC to fulfill a requirement). Additionally, mastery-goal driven learners may not all aim to earn a certificate. It is quite possible that some of the mastery-goal driven learners are only interested in a subsection of the course, explaining why they did not complete the course and earn a certificate.

Table 5

*Logistic Regression Analysis of Earning a Certificate or Not From Mastery-goal Orientation and Intention Types*

Covariates	<i>B</i>	<i>SE</i>	Wald	<i>df</i>	<i>P</i> value	Exp( <i>B</i> )
Mastery-goal orientation	.195	.211	.854	1	.355	1.215
Certificate intent	1.531	.313	23.971	1	<b>&lt; .001</b>	4.625
Constant	-4.152	.897	21.424	1	<b>&lt; .001</b>	.016

For the third logistic regression analysis (Table 6, below) looking into how performance-goal orientation and intention types relate to earning a certificate or not, a test of the full model against a constant only

model was statistically significant ( $\chi^2[2] = 40.440, p < .001$ ) indicating that performance-goal orientation and intention types together as a set distinguished between learners who earned a certificate and those who did not. The Wald test results showed that performance-goal orientation ( $\chi^2[1] = 9.333, p = .002$ ) and intention types ( $\chi^2[1] = 31.358, p < .001$ ) were individually each statistically significant within the combined model. Performance-goal orientation was negatively associated with earning a certificate while intention types were positively associated with earning a certificate. The magnitude of effect, shown by the *B* coefficients, was larger for certificate intent than performance-goal orientation. This result indicates that learners who are more performance-goal oriented are less likely to earn a certificate. It is possible that some learners who may learn better in environments that are more akin to the traditional face-to-face classrooms where their performance can be visibly demonstrated to fellow learners and instructors. The reduced opportunities to interact with fellow learners and instructor in the MOOC context may lead to a dwindled motivation in learning for these performance-oriented learners.

Table 6

*Logistic Regression Analysis of Earning a Certificate or Not From Performance-Goal Orientation and Intention Types*

Covariates	<i>B</i>	<i>SE</i>	Wald	<i>df</i>	<i>p</i> value	Exp( <i>B</i> )
Performance-goal orientation	-.551	.180	9.333	1	<b>.002</b>	.576
Certificate intent	1.713	.306	31.358	1	< .001	5.547
Constant	-2.414	.356	45.856	1	< .001	.089

## Discussion

### Intention is Related to Completion (Table 1)

Consistent with past studies examining the relation between intention and behavior (e.g., Orbell & Sheeran, 1998), a learner's intention of earning a certificate is associated with actually earning a certificate in this MOOC. However, there remains a gap between intention and behavior in this MOOC setting. As in Sheeran's (2002) work on the imbalance between intention and behavior, it was more common for learners to fail to earn certificates despite their intention to earn a certificate than it was for learners to earn a certificate despite their intention not to earn a certificate. It appears that many of the learners who earned certificates without intending to do so were high in grit. Fully understanding this pattern of results is an important topic for future work; we discuss this further below. Moreover, many learners did not intend to complete the course and did not complete the course. It is worth asking: What were these learners' goals for the course? Developing a typology of the types of learners who never intend to complete MOOCs will be

an important step towards understanding these learners in their full complexity and serving their learning needs as effectively as possible.

### **Academic Efficacy and Goal Orientation are Associated With Intention (Table 2)**

Learners who intended to obtain a certificate differ from learners who did not intend to obtain certificates in terms of both mastery goals and performance goals. Specifically, learners who intended to obtain certificates were likely to be higher both in mastery-goal orientation and in performance-goal orientation than learners who did not intend to obtain certificates.

Grit was not significantly different between the learners who intended to complete the course, and the learners who did not intend to complete the course (despite the relationship between grit and course completion). But academic efficacy was higher for learners who intended to earn certificates than learners who did not intend to earn certificates.

Need for cognition was not significantly different between the learners who intended to complete the course and those who did not. Both of these groups of learners rated NFC highly. This result is somewhat expected since learners voluntarily decide to take a MOOC and gain little extrinsic benefit from doing so, compared to many other activities that they could choose. Therefore, it is plausible that most MOOC learners would exhibit a strong NFC.

### **Grit and Earning a Certificate**

Certificate earners showed marginally significantly higher grit than learners who did not earn certificates, with a fairly large effect size. A follow-up analysis showed that grit and intention independently predict whether or not a learner earns a certificate. It is interesting to note that grit was associated with completion even though it was not associated with intention. One possible interpretation of this result is that not all gritty learners intend to complete the course, but that their grit leads them to do so anyways. Once the learner starts the activity, their drive to complete what they start overrides their initial intention. For instance, it is possible that some high-grit learners intend to study only a subsection of the course, but that their grit led them to study the rest as well. Collecting qualitative data on these learners' experience may help us to better understand why these learners do choose to complete the course, despite their initial plans and intentions.

### **Other Aspects of Motivation and Earning a Certificate (Table 3)**

Both mastery goals and performance goals were significantly different between certificate earners and learners who did not earn certificates. Specifically, certificate earners reported being higher in mastery-goal orientation than learners who did not earn certificates. By contrast, learners who did not earn certificates reported being higher in performance-goal orientation than certificate earners. However, both certificate earners and noncertificate earners scored low on the performance-goal orientation subscale. It is worth noting that performance goals were positively associated with certificate intention but negatively associated with actual completion. It is possible that some learners who intend to earn a certificate might wish to do so in order to demonstrate their capability and obtaining favorable judgments from others. It is also possible that performance-avoidance goals, the goal of avoiding failure (Elliot, 1999), may have played a role in the lower completion; the PALS scale used in this research does not distinguish between different types of

performance goals. Fully understanding the relationship between goal orientation and course completion in MOOCs will likely require further research with an instrument that distinguishes between types of performance goals.

### **Connection to Results in Other Domains**

In this paper, we find that certificate earners rated themselves higher on the mastery-goal orientation and lower on performance goal orientation. These results are consistent with past literature when the same set of constructs were measured in traditional learning contexts such as in-person classrooms (e.g., Pintrich, 2000). This pair of results enrich the understanding of how broadly the relationships between goal orientations and learning outcomes are consistent.

However, performance goals were found in our study to negatively correlate with obtaining a certificate, whereas previous work in other settings has found that performance goals correlate positively with learning outcomes (e.g., Harackiewicz, Barron, Tauer, Carter, & Elliot, 2000). Since performance goals are related to judgment on one's ability relative to others (Midgley, Kaplan, & Middleton, 2001), the relative lack of peer and instructor contact identified in the MOOC environment (e.g., Alario-Hoyos et al., 2017) may alter the impacts of learners' performance-goal orientation. In particular, learners may compare themselves to the most knowledgeable participants in the course, those who frequently post to the forums, rather than the silent majority of MOOC learners, making students believe they are performing worse than they actually are, and thereby reducing their motivation to complete.

The relationships seen between completion and goal orientation, however, contradict the results of a previous study of goal orientation in MOOCs conducted in an earlier version of the same MOOC, which did not find relationships between goal orientation and course completion (Wang & Baker, 2015). This may be due to the different formats of the assignments. The version of the course studied in this paper used intelligent tutoring system-based assignments with automated help including step-by-step guidance, as discussed above. By contrast, the version of the course studied in the previous study (Wang & Baker, 2015) did not include the same level of support for the assignments; its assignments were the type of quiz-style assignments typically seen in the Coursera and edX platforms. Therefore, a different set of learners might plausibly have completed activities when this additional support was present. Additionally, the two iterations of the course were hosted on two different MOOC platforms (Coursera versus edX), which might also have contributed to the different results, given the many differences in design and population served between the two platforms.

Academic efficacy was not found to be statistically significantly different between learners who earned certificates and learners who did not earn certificates. Instead, both certificate earners and nonearners generally have high academic efficacy. The lack of a finding here is somewhat surprising since past studies in other learning settings have found that higher academic efficacy is associated with higher learning outcomes (e.g., Multon, Brown, & Lent, 1991). But as pointed out in other articles (Breslow et al., 2013), many learners learn in MOOCs but choose not to complete the course.



There was also not a significant difference in NFC between certificate earners and learners who did not earn certificates. The same lack of finding was seen for intention. MOOC learners generally rated NFC highly, regardless of whether they earned a certificate or intended to do so.

As such, goal orientation and grit appeared to be associated with MOOC completion, but other motivational variables did not seem to have that same relationship.

## Limitations and Future Directions

The research presented in this paper related MOOC completion to learner intention to complete, goal orientation, grit, and other motivational variables. Several findings were obtained, but it is important to note that the present study only explored the relationship between these variables within the context of a single MOOC. Considering this, future work should collect and analyze data from different MOOCs across disciplinary areas to determine whether findings obtained in the present study are general. Doing so remains challenging, as many MOOCs give only brief precourse surveys, or no surveys at all; encouraging MOOC instructors and developers to add more extensive surveys has the potential to move research in this field forward.

In addition, further analyses should also take into consideration the different reasons why a learner may enroll in a MOOC while not intending to earn a certificate. It will be valuable going forward to more thoroughly investigate the diversity of reasons why learners enroll in MOOCs in order to better assess whether a MOOC is succeeding for all its learners. Past studies have identified distinct learner groups based on behavior (Kizilcec et al., 2013). It might also be useful to directly ask whether a learner intends to only study a subsection of the course—perhaps even a single video—or to only use some types of resources. This type of question could be answered through broader questionnaires, perhaps given after course completion; follow-up interviews with learners may help reveal even more insights by allowing us to probe the reasons behind specific choices. Additionally, better understanding of learner intention types can help enable psychological researchers to better track, model, and ultimately understand learner behavioral patterns relevant to each of the activities a learner expresses an intention to participate in. For instance, it can be useful to use analytics and knowledge engineering methods to investigate further within the course logs whether a learner who intends to study only a sub-section of the course actually watches more videos and completes more assignments relevant to that sub-section. By doing so, the relationship between learner intention and MOOC participation can be understood in a finer-grained fashion in order to tailor MOOCs better to all of the learners who use them.

## Acknowledgment

This work was supported by the National Sciences Foundation, Award #DRL – 1418378, *Collaborative Research: Modeling Social Interaction and Performance in STEM Learning*.

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July – 2018

## Social Presence in Massive Open Online Courses



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### Abstract

The capacity to foster interpersonal interactions in massive open online courses (MOOCs) has frequently been contested, particularly when learner interactions are limited to MOOC forums. The establishment of social presence—a perceived sense of somebody being present and “real”—is among the strategies to tackle the challenges of online learning and could be applied in MOOCs. Thus far, social presence in MOOCs has been under-researched. Studies that previously examined social presence in MOOCs did not account for the peculiar nature of open online learning. In contrast to the existing work, this study seeks to understand how learners perceive social presence, and the different nuances of social presence in diverse MOOC populations. In particular, we compare perceptions of social presence across the groups of learners with different patterns of forum participation in three edX MOOCs. The findings reveal substantial differences in how learners with varying forum activity perceive social presence. Perceptions of social presence also differed in courses with the varying volume of forum interaction and duration. Finally, learners with sustained forum activity generally reported higher social presence scores that included low affectivity and strong group cohesion perceptions. With this in mind, this study is significant because of the insights into brings to the current body of knowledge around social presence in MOOCs. The study’s findings also raise questions about the effectiveness of transferring existing socio-constructivist constructs into the MOOC contexts.

*Keywords:* social presence, MOOCs, forum participation



## Introduction

With the steady expansion of online education, the numbers of students enrolling in scaled open courses (e.g., massive open online courses [MOOCs]) worldwide have reached beyond millions (Shah, 2015). Such an explosion in student numbers obviously has implications for the design of education at scale and its capacity to promote and facilitate peer interactions. The dynamics of MOOCs creates a challenging environment for stimulating and fostering peer interactions (Daniel, 2012). This is due to the unprecedented volume of communication, often at a scale several orders of magnitude larger than in formal courses. Open participation in MOOCs further contributes to the difficulty of peer interactions. As the learners are not obliged to engage in social activities or complete the assigned assessment in the course, they exhibit varying patterns of use when it comes to the course resources (Bergner, Kerr, & Pritchard, 2015; Eynon, Gillani, Hjorth, & Yasseri, 2014).

Limited capacity to foster interpersonal interactions challenges the quality of online educational experience in MOOCs. Learning science and contemporary educational research demonstrates that engagement in peer interactions can bring numerous cognitive and socioemotional benefits. For instance, peer interactions may enhance a student's understanding by allowing the student to verbalise a problem, seek or receive help, or co-constructing a solution (Bransford, Brown, & Cocking, 2000; Dillenbourg, Baker, Blaye, & O'Malley, 1996; Webb, 1982). Perceptions of belonging to a group and the development of trust that are fostered through peer interactions also impact learning more indirectly insofar as they influence student motivation and satisfaction (Arbaugh & Benbunan-Fich, 2006; Johnson, 1981; Thomas, 2000). The potential of experiencing these kinds of cognitive and emotional learning supports in MOOCs remains questionable.

Within formal online education, social presence is one of the constructs that helps examine the link between peer interactions and student learning. In small formal online courses, social presence has been closely associated with the development of interpersonal interactions and the garnering of a learner community over time (Gunawardena, 1995; Rovai, 2002; Rovai & Barnum, 2007; Swan, 2002, 2004). It has further been deemed important for maintaining a high degree of peer interaction (Kreijns, Kirschner, Jochems, & Buuren, 2011) and even regarded as the vehicle driving social learning (Tu & McIsaac, 2002). Research has also demonstrated the positive impact social presence has on students in terms of retention and academic performance (Boston et al., 2009; Liu, Gomez, & Yen, 2009), and a recent meta-analysis revealed a strong correlation between social presence and perceived learning (Richardson, Maeda, Lv, & Caskurlu, 2017).

This study adopts a social presence lens to examine the effects of interpersonal interactions on learner perceptions in MOOCs. Social presence in MOOCs has been largely underexplored. Kop and Fournier (2013) suggested that the development of social presence at scale could counter anonymity in MOOCs, but their call for examining social presence in MOOCs has barely been addressed. The findings in the few existing studies appear aligned with those derived from formal online education. For instance, Cheung (2014), examined the forum discourse to derive social presence indicators and found that those learners exhibiting higher social presence tend to receive a higher final grade. Kilgore and Lowenthal (2015) surveyed participant perceptions of social presence in their MOOC and demonstrated that social presence can be established at scale; they argued that it should, therefore, be facilitated within the massive cohorts.

The current study draws attention to a limitation that permeates through the existing research of social presence in MOOCs. We argue that existing investigations of social presence are methodologically unsuited to describe MOOC contexts. MOOC forums garner a context for interaction that is dissimilar to that of more formal education courses. For example, unlike individuals in formal online courses, MOOC learners are highly

diverse in the way in which they participate in forums—that is, all learners do not start the course on the same day, nor do they all follow the course until the end (Yang, Sinha, Adamson, & Rosé, 2013). Without a requirement to commit to studying, some MOOC learners use forums to find what they need quickly; others join at random times throughout the course; and some learners consider the forum to be an essential part of their online experience (Eynon, Gillani, Hjorth, & Yasseri, 2014). The construct of social presence in formal online courses, however, presupposes continuous appearance of the same group of students throughout the course, as well as the continuity of interactions among them. This *continuity assumption* is also evident in the scholarly descriptions of the elements of social presence (Garrison & Akyol, 2013).

The existing studies of social presence in MOOCs made no methodological adjustments to account for these important differences between formal online courses and MOOCs. Hence, the insights derived from these studies are ill-suited to the specificities of the MOOC environment, and their findings are difficult to interpret. The aim of the current study is to understand how to evaluate social presence in MOOCs so that it captures the complexity of MOOC environments. To do so, our study analyses social presence in MOOC environments in two ways: analysis is conducted first on data from the entire respondent sample, and second, on that from different subpopulations of posters in MOOC forums. The data used in the study was collected from three MOOCs delivered via edX platform in 2014. The research design is exploratory, as log data of forum posting activity is combined with self-reported data. Drawing on our findings, we argue that accounting for the differences in how learners use the forums allows a more nuanced understanding of social presence in MOOCs, and that this can offer instructors a more accurate evaluation of how well they facilitate social presence. More importantly, our analysis of social presence in learner subpopulations shows a somewhat different picture of social presence than that which is found across the entire group of respondents. These discrepant results raise a critical question about how the constructs developed within formal online education should be transferred and adapted as new digital environments continue to emerge.

## Literature Review

### Social Presence

Social presence can be intuitively described as “feeling as if someone is socially present in one's life although they are not physically in the same space” (Kim, Song, & Luo, 2016, p. 674). However, as highlighted through a recent meta-analysis, definitions and operationalisations of social presence are greatly varied (Richardson et al., 2017), including meanings such as “social interaction, immediacy, intimacy, emotion, and/or connectedness” (Lowenthal, 2009, p. 4). In this section, we briefly review the historical development of the concept to distinguish some of the critical differences in definitional foci. We then focus on the operationalisation of social presence within the Community of Inquiry (CoI) model (Garrison, Anderson, & Archer, 1999), as this study used the CoI survey instrument to collect participant perceptions of social presence. Finally, recent developments in social presence concept are outlined.

**Definitions of social presence.** Distance education researchers originally became interested in social presence because of the perceived lack of communication cues in educational technologies. Technology that afforded intimacy and immediacy in communication was seen as instrumental in shortening the psychological distance between two speakers (Swan, 2003). Short, Williams, and Christie (1976) changed the essence of social presence definition from the affordances of the technological medium to learner perceptions

to the level of “salience” emerging from the interaction between two or more participants. Subsequent social presence theorists built upon the conceptual premise put forward by Short et al. (1976). Gunawardena (1995) adopted Short et al.’s understanding of social presence, and the concept was further extended by Rourke, Anderson, Garrison, and Archer (2001) to include individual’s ability to project oneself emotionally and socially. Both Rourke et al. (2001) and Picciano (2002) added new layer of meaning to the construct of presence, characterising it as having socioemotional quality through connectedness and the sense of belonging. Lowenthal (2009) described various social presence definitions as being positioned on a continuum: social presence defined as perception of another person being real situated at the one end on the spectrum, and social presence defined as perceptions of another person also characterised with a certain socio-emotional quality (as well as one’s ability to project oneself emotionally) located at the other.

**Operationalisation of social presence within the CoI model.** Operationalisations of social presence vary as much as their corresponding definitions (see Kreijns, Van Acker, Vermeulen, & Van Buuren, 2014; Richardson et al., 2017). Among the instruments most commonly used to capture social presence is a component of the CoI model (Garrison et al., 1999; Na Ubon & Kimble, 2004; Tu, 2002; Weaver & Albion, 2005). Within the CoI model, social presence is linked to the emergence of one-to-one interpersonal relationships that evolve into a learning climate that is supportive of open, critical disagreement (Garrison & Akyol, 2013). Specifically, social presence within the CoI model is defined as “the ability of participants to identify with the community (e.g., course of study), communicate purposefully in a trusting environment, and develop interpersonal relationships by way of projecting their individual personalities” (Garrison, 2009). Garrison, Cleveland-Innes, and Fung (2010) validated the survey instrument and confirmed that social presence serves as a mediator between teaching presence and cognitive presence, indirectly influencing student learning. Gutiérrez-Santiuste, Rodríguez-Sabiote, and Gallego-Arrufat (2015) similarly showed strong correlations between social presence and cognitive presence.

CoI operationalisations of social presence have been challenged by Kreijns et al. (2014). This challenge has been further developed by Weidlich and Basianens (2017). Their critique is largely in line with the argument that definitions of social presence often blur the line between “social presence and psychological or behavioural effects/causes/correlates of social presence” (Biocca et al., 2003, cited in Kim et al., 2016). Detailed discussion of these conceptualisations is beyond the scope of this paper; for a short discussion of how these critiques relate to this study’s findings, see Discussion section.

Considering the validity of the CoI model and measures and its extensive use among online education practitioners, this study applied the CoI questionnaire to collect students’ perceptions of social presence in MOOC contexts. We opted to use the CoI instrument as it has been extensively validated across different learning settings (Arbaugh et al., 2008; Carlon et al., 2012; Díaz, Swan, Ice, & Kupczynski, 2010), including a recent validation of the CoI instrument within MOOC settings (Kovanović et al., 2017). The social presence aspect of the CoI survey instrument inquires about students’ perceptions of three components of social presence: (1) *group cohesion*; (2) *open communication*; and (3) *affective expression*.

### **Social Presence in a MOOC Context**

Although the importance of social presence in online learning settings has been well noted (Joksimović, Gašević, Kovanović, Riecke, & Hatala, 2015; Picciano, 2002; Rovai, 2002; Tao, 2009), an overwhelming majority of research in the area of social presence is situated within the formal education context. Only a few studies examine learner perceptions of social presence in MOOCs. Kilgore and Lowenthal (2015), for example,

found that MOOC participants “were able to experience social presence first hand and that social presence can be established in large online courses” (p. 398). In contrast, Damm (2016) demonstrated that most of their MOOC learners either disagreed that social presence was established across the different aspects of the MOOC, or marked social presence as a nonapplicable aspect for their course evaluation.

A more recent examination of the CoI survey instrument in MOOC settings was conducted by Kovanović et al. (2017). The authors demonstrated that some of the sub-constructs within the CoI model were more prominent than expected in a formal setting and in a MOOC setting can be viewed as standalone constructs. In particular, when it comes to social presence, affective expression had different dynamics than the rest of the social presence constructs (as indicated by a factor analysis). This particular finding raises questions about how social presence is formed to begin with. In models of formal online education, affective expression has been hypothesized to have a relationship with another subconstruct: group cohesion. Akyol, Garrison, and Ozden (2009) showed that as affective expression levels decrease over time within a course, group cohesion levels tend to increase. Similarly, later models (Kreijns et al., 2014; Weidlich & Bastiaens, 2017) theorise a causal relationship between impression formation (similar to affective expression) and social space (similar to group cohesion). The finding by Kovanović et al. (2017) that affective expression could be viewed as a factor separate from social presence suggests that in MOOCs—in contrast to formal, bounded groups of learners—the relationship between the formation of one-to-one impressions and group development may differ.

Despite the clear differences between the MOOC context and formal online education, as well as possible differences in how social presence may unfold at scale, research surrounding social presence in MOOCs has not addressed these methodologically or in any conceptual manner. Hence, in the studies that focused on social presence in MOOCs (Appiah-Kubi & Rowland, 2016; Cheung, 2014; Kilgore & Lowenthal, 2015), all forum users were treated as if they all started on the same date and interacted continuously. Such an approach assumes that the entire population of learners surveyed was appropriately described by a continuity of interactions, as is ideally the case in a formal online cohort. However, in a MOOC setting such an assumption does not hold; hence, the learner population being studied is incompatible with the instrument applied.

To address the discrepancies between the context used to derive the concept of social presence and the MOOC context, this study evaluates social presence perceptions across the group of forum users with a differing commitment to social activity. Empirical research of MOOC forums has offered substantial evidence that there are clear participation patterns in MOOC forums. Existing classifications of MOOC engagement patterns in forums reveal that a small group of learners engage persistently with the forums, which contrasts with the intermittent participation of a large number of learners who engaging and disengaging randomly (Coffrin, Corrin, de Barba, & Kennedy, 2014; Ferguson & Clow, 2015; Hecking, Chounta, & Hoppe, 2016; Kizilcec, Piech, & Schneider, 2013; Milligan, Littlejohn, & Margaryan, 2013; Poquet, 2017; Poquet, Dowell, Brooks, & Dawson, 2018; Rodrigues et al., 2016; Boroujeni, Hecking, Hoppe, & Dillenbourg, 2017). Moreover, viewing without posting has also been found to be the activity most characteristic of MOOC forum users (Bergner et al., 2015). Adjusting the CoI instrument to observe social presence across these different groups of learners would allow some alignment with the dynamics of MOOC forums.

## **Research Question**

In line with our argument about the mismatch between a socio-constructivist social presence construct and an open MOOC context, the present study was designed to address two research questions:

RQ1. What does social presence in MOOCs look like when evaluated across the entire group of forum users through the social presence aspect of the CoI model?

RQ2. What is the association between student perceptions of social presence and their levels of participation in MOOC discussion forums, and does this perception differ across the groups of learners with varying participation patterns?

By addressing these questions, this study demonstrates whether or not different ways of evaluating social presence bring consistent insights. Answering the second research question will help establish the relationship between student's self-reported perceptions of social presence and the log data derived from their posting activity.

## Method

Student perceptions of social presence were collected through the CoI questionnaire (Arbaugh et al., 2008). To better understand the association between levels of participation in MOOC forums and student perceptions of social presence, we compared self-reported levels of social presence between the groups with varying levels of forum activity: forum participants who consistently posted on the forums, those who posted occasionally, and those who did not post. The design of the study was exploratory, as we wanted to understand if the reported social presence would differ across these three groups, as well as if it would differ from the averages reported on the entire sample of respondents.

The survey was implemented in three edX MOOC run by the Delft University of Technology in 2014: (1) Delft Design Approach (DDA); (2) Introduction to Functional Programming (FP); and (3) Creative Problem Solving and Decision Making (TPM). The MOOCs differed in subject, duration, and pedagogical design in relation to forum activity. To account for course instructional, disciplinary, and contextual specificity, the analysis was done for each course separately. All students were invited to participate in a post-course survey administered in the final weeks of each course. In all three courses, no specially designed learning interventions were incorporated to facilitate interpersonal interactions.

### Data Description and User Groups

To account for the varying frequency and quality of participant forum use, survey respondents were divided into three groups based on the regularity of their forum activity rather than the volume of such activity. Poquet (2017) demonstrated that learners who participate regularly co-occur with one another over the course duration—that is, individuals posting with certain regularity are also defined by the continuity of interactions, much like cohorts inside formal online courses.

The first group, *regular posters*, comprised all MOOC learners making forum posts for three weeks or more (Table 3). If, for example, a learner made one post in week 1, three posts in week 5, and twenty posts in week ten, this person would be considered a regular poster. The division into regular and occasional posters was based both on data exploration and latent class analysis (for the method, please see Poquet et al., 2018; model outputs not reported here). Latent class analysis of this dataset replicated the findings of Poquet et al. (2018) that learners who post in any three weeks of a course are more likely to use the forums longer, whereas learners who post in any two weeks are more likely to use the forums for two weeks only.

The second group of participants, *occasional posters*, included all students who had posted in the discussions at any time for (any) one or two weeks of the course.

Finally, course participants who did not post in the discussions but filled out the questionnaire were grouped as *non-posters*.

Table 1

*Data Description: Summary of the Sample*

Course	Enrolled students	Certified students	Course duration (weeks)	Regular forum posters	Occasional forum posters	Forum contributors (total)	Survey responses (total)	Regularly-posting respondents	Occasionally-posting respondents
DDA	13,503	136	10	62	442	504	78	18	29
FP	38,029	1,968	8	177	850	1,027	1,066	117	243
TPM	32,424	1,396	5	72	998	1,070	511	27	137

**Course 1: Delft Design Approach.** DelftX DDA691X (Delft Design Approach, or DDA) was delivered by the Faculty for Industrial and Product Design. The 10-week course had 13,503 registered participants, with 136 course certificates awarded. The course employed interactive tasks, and learners were encouraged to discuss these on the forum. Peer assessment was a part of the course design. Student forum activity in the course decreased from 703 contributions in the first week to 237 in week 2 (see Table 2, below).

Course activity decreased in volume, with a small group of 62 regular posters repeatedly contributing to the forum for three or more weeks of the course (see Table 1, above). At the end of the course, a total of 78 respondents completed the CoI surveys, with 18 of them being regular contributors, 29 occasional contributors, and 37 non-posters. From those who completed the survey, more than half were completers with certificates; the remaining respondents also included learners who started the course but did not complete it, and those who audited parts of the course.

**Course 2: Introduction to Functional Programming.** The second course, DelftX FP101X (Introduction to Functional Programming, or FP) was delivered by the Faculty of Computer Science. The eight-week course was based on the foundations of functional programming using the Haskell programming language. The course assessed learner knowledge through quizzes and had no special provisions for the forum activity, except that the course instructor and several teacher assistants actively communicated with the students on the forum. The course enrolled 38,029 students and certified 1,968 of them.

The volume of forum activity decreased from week 1 to week 2, but the decrease was not as drastic as that observed in DDA. The volume of interactions fluctuated between 700 and 900 interactions weekly, produced by some 160 to 200 students (see Table 2, below). Thirteen participants interacted with others every week of the course, and the group of regular contributors comprised 177 participants (see Table 1, above).

CoI surveys at the end of the course were completed by 1,066 individuals, 117 of which were regular contributors, 243 occasional contributors, and 706 non-posters. Similar to the DDA sample, the respondents mostly represented the certified completers, but also included people auditing the course and students who disengaged at some point during the course.

Table 2

*The Number of Posts and Posters in Every Subsequent Week of the Course*

	<b>Week 1</b>	<b>Week 2</b>	<b>Week 3</b>	<b>Week 4</b>	<b>Week 5</b>	<b>Week 6</b>	<b>Week 7</b>	<b>Week 8</b>	<b>Week 9</b>	<b>Week 10</b>
<b>Number of forum contributions per week</b>										
<b>DDA</b>	703	237	283	285	108	94	69	57	24	85
<b>FP</b>	1,331	914	1,084	747	960	828	653	646	--	--
<b>TPM</b>	1,839	825	357	224	38	--	--	--	--	--
<b>Number of posters contributing per week</b>										
<b>DDA</b>	304	104	106	89	48	44	23	24	16	41
<b>FP</b>	392	292	219	181	177	174	177	154	--	--
<b>TPM</b>	693	364	186	119	30	--	--	--	--	--

Table 3

*Total Weeks of Contribution Per Poster*

<b>Number of weeks total in which posters contributed</b>		<b>1 week</b>	<b>2 weeks</b>	<b>3 weeks</b>	<b>4 weeks</b>	<b>5 weeks</b>	<b>6 weeks</b>	<b>7 weeks</b>	<b>8 weeks</b>	<b>9 weeks</b>	<b>10 weeks</b>
<b>DDA</b>	369	73	26	12	8	6	2	5	2	1	
<b>FP</b>	675	175	80	43	24	14	3	13	--	--	
<b>TPM</b>	846	152	47	24	1	--	--	--	--	--	

**Course 3: Creative Problem Solving and Decision Making.** The third course was DelftX TPM1X (Creative Problem Solving and Decision Making, or TPM). This five-week course was delivered by the Faculty of Technology, Policy, and Management. It enrolled 32,424 students. Of the total enrolled student cohort 1,396 received certificates of completion. TPM was shorter in duration than either DDA or FP. The course was designed so that each week had a distinct focus, with the course outcomes being assessed through weekly quizzes. No activities were designed to facilitate forum participation. Forum activity in the TPM course experienced a steep drop in activity not only from the first to the second week of the course, but for each consecutive week (see Table 2, above). No MOOC participants in this course interacted with another participant every week of the course (see Table 3, above). That is, the group of regular posters comprised a very small percentage of all forum users, and the volume of activity in this course was smaller than in the first two courses.

Overall, 511 CoI surveys were completed at the end of TPM. Among the respondents, 27 individuals were regular posters, 37 occasional posters, and 347 were non-posting participants. As in the other two courses, the sample mostly represented certified students but included those who audited and those who became disengaged sometime during the course.

### **Instruments**

The respondents provided answers to nine questions from the CoI instrument (Arbaugh et al., 2008) about their perceptions of social presence in the respective courses. The students were asked to agree or disagree with the statements on a five-point Likert scale (from 1–5). The first three questions addressed students' affective expression; questions 4 through 6 addressed perceptions of the open communication, and the questions 7 through 9 inquired about the perceptions related to group cohesion. Table 6 (below) includes the instrument's questions.

### **Data Analysis**

A series of nonparametric Kruskal-Wallis tests for each of the nine survey items investigated whether there were significant differences in social presence scores among the groups of students. Given that the survey items used an ordinal Likert scale, and that there were differences in the size of the three groups of students, we opted for the use of nonparametric significance tests. To control for the inflated Type I error rate that may result from multiple consequent comparisons, we used the Holm-Bonferroni correction procedure (Holm, 1979). This procedure offered more statistical power than the ordinary Bonferroni correction while preserving a strict control over family-wise error rate (FWER) (Holm, 1979). The significant Kruskal-Wallis tests ( $p < .05$ ) were then followed up with a Dunn test, also with a Holm-Bonferroni correction.

## **Analysis**

### **RQ1. What Does Social Presence in MOOCs Look Like When Evaluated Across the Entire Group of Forum Users Through the Social Presence Aspect of the CoI Instrument?**

The results of CoI survey suggest that MOOC learners who completed the post-course questionnaire established some degree of social presence. The average scores for different survey questions varied between 2.7 to 3.9 (on a 1–5 scale; see Figure 1, below). Unfortunately, these scores cannot be statistically compared to



those previously reported in the studies of formal online education (since the scores represent ranked data within the subgroups of varying size).

From a descriptive point of view, social presence scores previously reported in formal online courses were typically higher than 3.0 and are collected from groups of 10 to 15 people interacting in courses lasting for up to 16 weeks. For instance, Akyol et al. (2009) reported a range of 3.94 to 4.30; the students in the study by Swan et al. (2008) yielded a mean social presence score of 4.18. Other studies have observed ranges of 3.67 to 4.06 (Maddrell, Morrison, & Watson, 2011); 2.97 to 3.47 (Lowenthal, Lowenthal, & White, 2009); and an average of 3.85 (Lowenthal & Dunlap, 2011). It appears that in the examined MOOC settings, where larger groups of learners interacted for a shorter time than in previously-examined formal online courses, social presence could be established. This generally supports the observations of previous work investigating social presence in MOOCs.

Consistent patterns of social presence evaluation are observed across the courses, with affective expression (Q1–Q3) being rated as lowest, and open communication (Q4–Q6) rated as highest. In their analyses of social presence development over time, Akyol and Garrison (2008) pointed out that open communication, along with affective expression, is the most prominent in the initial stages of social presence development, whereas group cohesion slowly grows over time as the group identity forms. It is, then, noteworthy that the affective expression of the learners yielded the lowest scores, which is in contrast to what would be expected from formal online settings. Reported open communication and group cohesion, however, can be interpreted as aligned with what has been observed in other educational contexts.

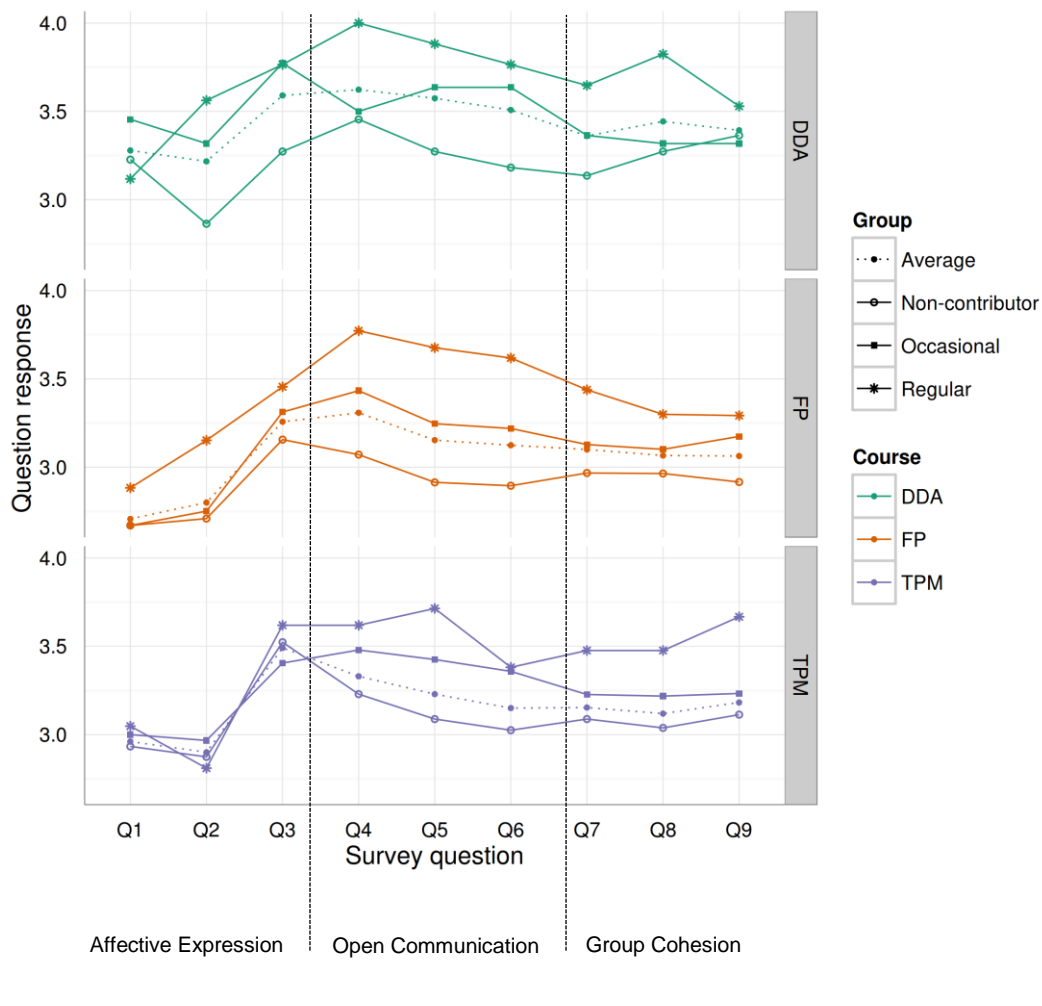


Figure 1. Students’ social presence scores for each of the survey question (per group, per course).

There are also substantial differences in the levels of social presence established. The size of the posting cohort and the duration of the MOOC seem to be associated with the levels of social presence reported across the entire sample. The highest scores for social presence (range: 3.2–3.7) were reported by the participants in the analysed MOOCs with the smallest number of total participants (i.e., DDA). Besides having the smallest group of regular posters, DDA had a sizable volume of forum interactions. In contrast, the size of the regular cohort and volume of interactions in TPM course was similar, but the range of average social presence was slightly lower (2.9–3.5). This could be explained by the fact that TPM lasted half the time of DDA. Finally, the lowest average social presence was observed in the massive FP course (2.7–3.3). The size of the contributing cohort in FP was three times larger than in DDA. Furthermore, the volume of interactions was much higher—for example, the last week of FP garnered about eight-times more interactions than the last week of DDA.

The properties of analysed MOOCs (i.e. size of the cohort, duration of the course, and the volume of interactions) may explain the differences among the social presence scores, irrespective of consideration for pedagogies that contextualise interpersonal interactions. The importance of the course duration was similarly highlighted in the meta-analysis by Richardson et al. (2017) who found that the duration of the course mediated between the social presence and satisfaction. In the analysed courses, the instructors have not given

specific tasks that integrated the use of forums, and forum participation was not graded. Although DDA had embedded peer assessment within the course, our look at the discussions on the forum suggested that the discipline of the course had more to do with its heightened interactivity.

The most important observation to be drawn from Figure 1 is that the levels of social presence reported from the entire sample do not offer an accurate representation of the levels of social presence established in the course. The average social presence scores are skewed by the lower levels reported by the non-posting students, and by the higher levels reported by the regular forum posters (see Figure 1, above). Had we only examined average levels of social presence for the whole of each course, as has been done in the previous research of social presence in MOOCs, DDA and TPM posters would appear to have established higher levels of social presence, while the largest cohort in the FP course lagged behind. However, such observation is inaccurate since the social presence construct (conceptually) examines perceptions of those who *can* establish social presence in principle—that is, those who interact regularly.

A comparison of the social presence scores reported by the regular posters (see Table 4, below) suggests that the TPM regular posters' scores are more aligned with the levels of social presence in the FP course, rather than those of DDA. That is, regular posters in TPM developed lower perceptions of open communication and group cohesion than regularly-participating students undertaking FP—and this despite a much larger cohort size in FP. Given that TPM had a smaller cohort posting, this should indicate that the social interactions within the course could have been less vibrant than expected. Further, FP's average portrays it as a course with quite low social presence, but the reported results of the regular posters are comparable with what is typically expected in a formal course. In other words, FP had a high volume of interaction in which, regardless of the large volume, posters managed to establish social presence almost as high as learners in much smaller groups, such as DDA and TPM. In conclusion, looking at the social presence scores by group demonstrates that FP and DDA were rather successful in terms of social presence, whereas TPM was less successful than expected.

As discussed, a valid comparison of social presence raw scores among the learner groups of varying engagement levels can be accomplished through the statistical analysis of differences between the groups. If applied to the entire cohort, social presence scores do not offer an accurate representation of perceptions from the regularly-participating learners.

## **RQ2. What is the Association Between Student Perceptions of Social Presence and MOOC Discussion Forum Participation?**

The patterns reported in Figure 1 were used as exploration. Further statistical comparison of the effect of participation levels on the social presence scores of each course revealed that student engagement levels was associated with differences in the perception of social presence. However, such a conclusion was not consistent across all analysed cases (see Table 4, below).

**Kruskal-Wallis tests—DDA results.** In the DDA course, the results of Kruskal-Wallis H-tests did not reveal significant differences between regular posters ( $n_r=18$ ), occasional posters ( $n_{occ} = 29$ ), and non-posters ( $n_{np} = 31$ ).

**Kruskal-Wallis tests—FP results.** For FP, statistical comparison between the groups reveals significant differences between the social presence scores in all three groups. A Kruskal-Wallis H-test highlighted the differences in how regular ( $n_r = 117$ ), occasional ( $n_{occ} = 243$ ) and non-posting ( $n_{np} = 706$ ) forum

participants responded to the CoI survey. None of the intergroup differences was statistically significant for the questions concerning affective expression, with the exception of Q2 ( $\chi^2_{Q2}(2) = 18.40, p_{Q2} = .00001$ ). Specifically, Dunn's post hoc test with the Holm-Bonferroni correction shows statistically significant differences between regular and occasional posters in relation to their ability to form distinct impressions of peers in the forum ( $r_{Q2r-occ} = .22$ ), as well as between regular posters and non-posting participants ( $r_{Q2r-np} = .17$ ).

The differences between the three groups of forum contributors were also significant for Q4 through Q9 (in the social presence part of the CoI instrument):  $\chi^2_{Q4}(2) = 76.36, p_{Q4} < .0001$ ;  $\chi^2_{Q5}(2) = 100.9, p_{Q5} < .0001$ ;  $\chi^2_{Q6}(2) = 88.26, p_{Q6} < .0001$ ;  $\chi^2_{Q7}(2) = 54.14, p_{Q7} < .0001$ ;  $\chi^2_{Q8}(2) = 32.12, p_{Q8} < .0001$ ;  $\chi^2_{Q9}(2) = 17.33, p_{Q9} < .0001$ . For all questions related to open communication (Q4–Q6), the degree of participation exerted a small-to-moderate effect in all three groups of participants. The differences between regular and non-posting participants were higher ( $r_{Q4r-np} = .31$ ;  $r_{Q5r-np} = .38$ ;  $r_{Q6r-np} = .35$ ) than those between regular and occasional posters ( $r_{Q4r-occ} = .21$ ;  $r_{Q5r-occ} = .28$ ;  $r_{Q6r-occ} = .25$ ) and those between occasional and non-posting participants ( $r_{Q4occ-np} = .21$ ;  $r_{Q5occ-np} = .2$ ;  $r_{Q6occ-np} = .19$ ). To summarize, the findings demonstrate a positive association between the level of learner participation and the level of comfort to converse online, to participate in the course discussions, and to interact with others on the forum.

Similar dynamics are reflected in the survey questions addressing group cohesion. All groups presented significant differences. The findings demonstrate that participation levels had a small effect on group cohesion perceptions ( $r_{Q7r-occ} = .22$ ;  $r_{Q7r-np} = .28$ ;  $r_{Q7occ-np} = .13$ ;  $r_{Q8r-occ} = .16$ ;  $r_{Q8r-np} = .22$ ;  $r_{Q8occ-np} = .11$ ;  $r_{Q9r-occ} = .11$ ;  $r_{Q9r-np} = .16$ ;  $r_{Q9occ-np} = .09$ ). As with other survey questions, regular posters reported the highest levels of comfort in disagreeing with others, and in being acknowledged by others (see Table 4, below).

Table 4

*Kruskal-Wallis Results*

	DDA			FPR			TPM		
	$\chi^2$ (df)	p value	Sig. pairs (r)	$\chi^2$ (df)	p value	Sig. pairs (r)	$\chi^2$ (df)	p value	Sig. pairs (r)
<b>CoI instrument survey questions</b>									
<b>Affective expression</b>									
1. Getting to know other course participants gave me a sense of belonging in the course.	0.71 (2)	.700		2.80 (2)	.246		1.92 (2)	.949	
2. I was able to form distinct impressions of some course participants.	7.27 (2)	.026		<b>18.40 (2)</b>	<b>&lt; .0001</b>	<b>Re-Oc (.22)</b> <b>Re-Np (.17)</b>	5.43 (2)	.779	
3. Online or web-based communication is an excellent medium for social interaction.	4.61 (2)	.100		7.26 (2)	.026		2.90 (2)	.294	
<b>Open Communication</b>									
4. I felt comfortable conversing through the online medium.	4.88 (2)	.087		<b>76.36 (2)</b>	<b>&lt; .0001</b>	<b>Re-Oc (.18)</b> <b>Re-Np (.31)</b> <b>Oc-Np (.21)</b>	<b>11.21 (2)</b>	<b>.003</b>	<b>Re-Np (.14)</b> <b>Oc-Np (.15)</b>

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5. I felt comfortable participating in the course discussions.	6.24 (2)	.044	<b>100.9 (2)</b>	<b>&lt; .0001</b>	<b>Re-Oc (.28)</b> <b>Re-Np (.38)</b> <b>Oc-Np (.20)</b>	<b>31.64 (2)</b>	<b>&lt; .0001</b>	<b>Re-Oc (.22)</b> <b>Re-Np (.28)</b> <b>Oc-Np (.20)</b>
6. I felt comfortable interacting with other course participants.	6.90 (2)	.032	<b>88.26 (2)</b>	<b>&lt; .0001</b>	<b>Re-Oc (.25)</b> <b>Re-Np (.35)</b> <b>Oc-Np (.19)</b>	<b>20.98 (2)</b>	<b>&lt;.0001</b>	<b>Re-Np (.21)</b> <b>Oc-Np (.18)</b>
<b>Group Cohesion</b>								
7. I felt comfortable disagreeing with other course participants while still maintaining a sense of trust.	2.12 (2)	.347	<b>54.14 (2)</b>	<b>&lt; .0001</b>	<b>Re-Oc (.22)</b> <b>Re-Np (.28)</b> <b>Oc-Np (.13)</b>	7.99 (2)	.029	
8. I felt that my point of view was acknowledged by other course participants.	3.31 (2)	.191	<b>32.12 (2)</b>	<b>&lt; .0001</b>	<b>Re-Oc (.16)</b> <b>Re-Np (.22)</b> <b>Oc-Np (.11)</b>	<b>15.24 (2)</b>	<b>.001</b>	<b>Re-Oc (.16)</b> <b>Re-Np (.20)</b> <b>Oc-Np (.13)</b>

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9. Online discussions help me to develop a sense of collaboration.	0.55 (2)	.761	<b>17.33 (2)</b>	<b>&lt; .0001</b>	<b>Re-Oc (.11)</b>	<b>18.37 (2)</b>	<b>.010</b>	<b>Re-Oc (.26)</b>
					<b>Re-Np (.16)</b>			<b>(.25)</b>
					<b>Oc-Np (.09)</b>			<b>Oc-Np (.10)</b>

*Note.* Holm-Bonferroni adjusted significance levels (from lowest to highest): .050, .025, .017, .012, .010, .008, .007, .006, and .006. Significant pairs bolded.

Re = Regular posters; Oc = Occasional posters; Np = Non-posting participants.

Table 5

*Mean (SD) Values for Social Presence Survey Question Responses*

	Affective expression			Open communication			Group cohesion		
	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9
<b>DDA</b>									
Regular posters	3.12 (0.99)	3.56 (0.81)	3.76 (1.20)	4.00 (0.87)	3.88 (0.86)	3.76 (0.83)	3.65 (1.00)	3.82 (0.73)	3.53 (1.18)
Occasional posters	3.45 (0.91)	3.32 (1.09)	3.77 (0.92)	3.50 (0.91)	3.64 (1.00)	3.64 (0.95)	3.36 (0.95)	3.32 (0.99)	3.32 (1.13)
Non-posting participants	3.23 (0.81)	2.86 (0.77)	3.27 (0.88)	3.45 (0.80)	3.27 (0.70)	3.18 (0.66)	3.14 (0.56)	3.27 (0.63)	3.36 (0.66)
Entire group	3.28 (0.90)	3.22 (0.94)	3.59 (1.01)	3.62 (0.88)	3.57 (0.88)	3.51 (0.85)	3.36 (0.86)	3.44 (0.83)	3.39 (0.99)

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<b>FP</b>									
Regular posters	<b>2.88</b>	<b>3.15</b>	<b>3.46</b>	<b>3.77(0.85)</b>	<b>3.68</b>	<b>3.62</b>	<b>3.44</b>	<b>3.30</b>	<b>3.29</b>
	<b>(0.87)</b>	<b>(1.00)</b>	<b>(1.00)</b>		<b>(0.86)</b>	<b>(0.79)</b>	<b>(0.71)</b>	<b>(0.74)</b>	<b>(0.87)</b>
Occasional posters	<b>2.67</b>	<b>2.75</b>	<b>3.31</b>	<b>3.43 (0.86)</b>	<b>3.25</b>	<b>3.22</b>	<b>3.13</b>	<b>3.10</b>	<b>3.17</b>
	<b>(0.86)</b>	<b>(0.94)</b>	<b>(0.85)</b>		<b>(0.84)</b>	<b>(0.81)</b>	<b>(0.67)</b>	<b>(0.60)</b>	<b>(0.82)</b>
Non-posting participants	<b>2.67</b>	<b>2.71</b>	<b>3.16</b>	<b>3.07 (0.84)</b>	<b>2.91</b>	<b>2.90</b>	<b>2.97</b>	<b>2.96</b>	<b>2.92</b>
	<b>(0.80)</b>	<b>(0.87)</b>	<b>(0.86)</b>		<b>(0.77)</b>	<b>(0.75)</b>	<b>(0.70)</b>	<b>(0.59)</b>	<b>(0.72)</b>
Entire group	<b>2.71</b>	<b>2.80</b>	<b>3.26</b>	<b>3.31 (0.89)</b>	<b>3.15</b>	<b>3.12</b>	<b>3.10</b>	<b>3.07</b>	<b>3.06</b>
	<b>(0.84)</b>	<b>(0.93)</b>	<b>(0.89)</b>		<b>(0.86)</b>	<b>(0.82)</b>	<b>(0.71)</b>	<b>(0.64)</b>	<b>(0.79)</b>
<b>TPM</b>									
Regular posters	3.05 (0.97)	2.81 (1.08)	3.62 (0.92)	<b>3.62 (1.02)</b>	<b>3.71</b>	<b>3.38</b>	3.48 (0.68)	<b>3.48</b>	<b>3.67</b>
					<b>(0.78)</b>	<b>(0.86)</b>		<b>(0.60)</b>	<b>(0.91)</b>
Occasional posters	3.00 (0.75)	2.97 (0.74)	3.40 (0.98)	<b>3.48 (0.85)</b>	<b>3.42</b>	<b>3.36</b>	3.23 (0.79)	<b>3.22</b>	<b>3.23</b>
					<b>(0.73)</b>	<b>(0.71)</b>		<b>(0.61)</b>	<b>(0.91)</b>
Non-posting participants	2.93 (0.79)	2.87 (0.82)	3.52 (0.87)	<b>3.23 (0.86)</b>	<b>3.09</b>	<b>3.03</b>	3.09 (0.75)	<b>3.04</b>	<b>3.11</b>
					<b>(0.79)</b>	<b>(0.78)</b>		<b>(0.69)</b>	<b>(0.78)</b>
Entire group	2.83 (0.75)	2.90 (0.81)	3.49 (0.91)	<b>3.33 (0.87)</b>	<b>3.23</b>	<b>3.15</b>	3.15 (0.76)	<b>3.12</b>	<b>3.18</b>
					<b>(0.79)</b>	<b>(0.78)</b>		<b>(0.67)</b>	<b>(0.84)</b>

Note. Results in bold indicate significant differences in mean ranks between groups.



**Kruskal-Wallis tests—TPM results.** Analysis of the affective expression perceptions in the TPM course shows no significant differences between regular forum posters ( $n_r = 27$ ), occasional forum posters ( $n_{oc} = 137$ ) and non-posters ( $n_{np} = 347$ ). That is, students formed impressions of others and developed a sense of community at the average and below-average levels regardless of their level of discussion activity. Such results are comparable to those of DDA, though generally DDA scores were slightly higher.

For TPM, significant differences were observed between the groups of regular posters and non-posters for open communication and, partially for group cohesion. As in FP, non-posters reported significantly lower levels of open communication (Q4–Q6) than regular and occasional forum posters ( $\chi^2_{Q4}(2) = 11.21, p_{Q4} = .003$ ;  $\chi^2_{Q5}(2) = 31.64, p_{Q5} < .0001$ ;  $\chi^2_{Q6}(2) = 20.98, p_{Q6} < .0001$ ). However, no differences exist in open communication between regular and occasional posters. In the TPM course, there were also no differences in how students evaluated their comfort to disagree with others while maintaining a sense of trust (i.e., Q7). The remaining group cohesion–related questions (Q8–Q9) all demonstrated a significant difference between the groups of varying participation levels ( $\chi^2_{Q8}(2) = 15.24, p_{Q8} = .001$ ;  $\chi^2_{Q9}(2) = 18.37, p_{Q9} < .01$ ). Small-effect differences were observed between the regular posters and non-posting participants ( $r_{Q8r-np} = .2$ ;  $r_{Q9r-np} = .25$ ), as well as between regular and occasional posters ( $r_{Q8r-oc} = .16$ ;  $r_{Q9r-oc} = .26$ ), and between occasional posters and non-posting participants ( $r_{Q8oc-np} = .13$ ;  $r_{Q9oc-np} = .1$ ).

## Discussion

This study examined the perceptions of social presence in three platform-based MOOC forums. From a practical perspective, online educators have long emphasized that establishing the social presence through sustained learner interactions in formal courses aids their engagement and motivation. Similarly, the establishment of social presence in open online courses such as MOOCs can help learners overcome the feeling of anonymity and solitude they experience within scaled interactions, as well as yield benefits from peer interactions that reach beyond simple information exchange. From a research perspective, few studies examined social presence in MOOC settings, and their findings were limited due to the lack of accounting for the unique characteristics of MOOC environments. We argued that MOOC discussion forums do not possess the interaction dynamics of the formal, small-scale online courses, and that researchers need to account for the differences between these two contexts carefully.

In lieu of conducting an evaluation of social presence based on the entire sample of respondents across the three analysed courses, we investigated social presence scores for different learner sub-populations in each course and compared the level of participation (i.e., regular poster, occasional poster, and nonposting participants) in the online discussions with perceived levels of social presence. The study found that perceptions of social presence differed between the learner subpopulations with different forum activity levels. The analysis also revealed that the overall evaluation of social presence within a MOOC differs (1) when the social presence scores were collected from individuals who continuously participated in the forums; versus (2) when the social presence scores were averaged from all the respondents. This is a significant finding because social presence scores in MOOCs have not been previously examined across learner subpopulations. The results demonstrate that learners who participated continuously established their social presence at levels above the group average. This suggests that instructors may not need to foster social presence for all learners joining the forums, and that evaluating established social presence at the end of the course is more meaningful when examined from regularly-participating individuals.

Our study also revealed that perceived levels of social presence varied between courses with different durations and levels of forum interactions. This finding is in line with the role given to course duration in the meta-analysis by Richardson et al. (2017). Previous studies (Lowry, Roberts, Romano, Cheney, & Hightower, 2006; Tu, 2002, among others) identified that the size of discussion groups is among the key aspects that affect student level of participation and interactivity, with larger groups having adverse effects on student discussion participation. In the present study, we observed that learners could establish a considerably high perceived levels of social presence. Our findings imply that the expected effect of the size and duration of a course is heightened in a MOOC. Among the three MOOCs investigated, the highest level of social presence was reported in the course with the smallest number of students (i.e., DDA), with no significant differences between the perceptions among learner subpopulations. However, in two larger courses (i.e., FP and TPM), social presence varied in line with the level of student activity on the forum: posters whose interactions were continuous and more regular reported higher levels of social presence than those who participated passively. The lack of differences in perceptions among the different learners in DDA could be explained as follows. In the course with the smaller group of active discussion participants, both passive and active participants can comprehend the volume of activity enough to establish social presence perceptions. However, in courses with larger volumes of activity, and with more active participants, students need to continuously participate to establish their social presence. Hence, our findings suggest that the size of the posting cohort and the duration of the course serve as mediating factors in the establishment of social presence. The scope of the impact of these findings needs to be further validated in future research.

Learners with sustained discussion activity generally reported higher social presence scores that included low affectivity and strong perceptions of group cohesion. The development of the affective dimension of social presence among discussion participants seemed to be the most challenging across all three analysed courses. Despite engaging in conversations and demonstrating higher comfort and more positive attitudes regarding the use of technology for in-course communication, even the students in DDA (the smallest course in size, and the course with the highest social presence perceptions) evaluated the establishment of familiarity, emotional connection, and sense of trust as low. On the other hand, group cohesion was reported as being highest by the same groups of learners. These findings are in line with the validation of the CoI instrument by Kovanović et al. (2017) who found that affective expression can be approached separately from the social presence construct. In other words, it appears that social presence in MOOCs is not based on affective interpersonal relations, but—despite the lack of interpersonal familiarity—group-related processes (open communication and group cohesion) may still be taking place.

Learner reporting of low affectivity and high group cohesion raises questions about the relevance of measuring social presence in MOOCs similar to the formal online educational settings. In the theories of formal online education, constructs related to the social context are dependent on an interpersonal one-to-one level of interaction and salience of the self. Despite references to the collective level, social context and identity within the overall conceptualisations of social presence in both Gunawardena and Zittle (1997) and Arbaugh et al. (2008) measure such one-to-one perceptions. More recently, Kreijns et al. (2014) and Weidlich and Basianens (2017) hypothesised that a person-to-person (dyadic) level construct reflecting impression-formation is a precursor of the group-level relational construct of social space. It could be extrapolated from our findings that in MOOC settings, given the lack of salience of the self and learner-reported perceptions of low affectivity and high group cohesion, relational perceptions of the group are not dependent on interpersonal relationships and unfold independently.

To offer further recommendations, analysis of social presence should be coupled with pedagogical designs; this was beyond the focus of this study. Also, our findings have some limitations that impact their generalisability. The present study was based on a small sample of courses delivered through the same MOOC platform, and the impact of contextual factors (i.e., size of posting cohort, duration of the course) is speculative. Further, the study did not investigate the relationship between the student perceptions of social presence and pedagogical and instructional contexts of the courses. For this course, the discipline context could be considered as more conducive to social interactions. Each of the courses we analysed had some distinct features, but understanding if these planned elements were effective, or concluding that they had effect on interactions, is not possible. That is, a more elaborate research design is needed to understand the interaction of course learning design, discipline, forum facilitation strategy; and volume of interaction, duration, size of regularly posting cohort. The same is true for the affect these factors have on student social presence perceptions.

## Conclusion

This study has provided the first steps of the investigation into the development of social presence in MOOC contexts. The study's research design integrated methodological considerations to make social presence examination specific to the educational context with scaled and open participation. It is evident that, even at scale, some courses offer more affordances for the establishment of social presence than others. However, methods of evaluating social presence are to be carefully considered. Although students reported that they established social presence, as measured by the CoI survey instrument, it is peculiar that their sense of trust remained low, tapping into whether the definition of social presence as underpinned by an interpersonal (person-to-person) emotional connection is at all relevant for a massive open online environment. The empirical results of this study contribute to the body of knowledge around social presence and raise questions about the transference of socio-constructivist constructs into the context of open online learning.

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July – 2018

## Understanding Student Engagement in Large-Scale Open Online Courses: A Machine Learning Facilitated Analysis of Student's Reflections in 18 Highly Rated MOOCs



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### Abstract

Although massive open online courses (MOOCs) have attracted much worldwide attention, scholars still understand little about the specific elements that students find engaging in these large open courses. This study offers a new original contribution by using a machine learning classifier to analyze 24,612 reflective sentences posted by 5,884 students, who participated in one or more of 18 highly rated MOOCs. Highly rated MOOCs were sampled because they exemplify good practices or teaching strategies. We selected highly rated MOOCs from *Coursetalk*, an open user-driven aggregator and discovery website that allows students to search and review various MOOCs. We defined a highly rated MOOC as a free online course that received an overall five-star course quality rating, and received at least 50 reviews from different learners within a specific subject area. We described six specific themes found across the entire data corpus: (a) structure and pace, (b) video, (c) instructor, (d) content and resources, (e) interaction and support, and (f) assignment and assessment. The findings of this study provide valuable insight into factors that students find engaging in large-scale open online courses.

**Keyword:** MOOCs, massive open online courses, engagement, text mining, machine learning

## Introduction

Online learning allows students to gain access to education despite spatial and temporal restraints. One of the most significant developments of online learning is the emergence of massive open online courses, or MOOCs for short. Taking a MOOC is convenient, flexible and economic for any individual with an Internet connection. According to the statistics presented by Class Central, a free directory of online courses that helps users find and track MOOCs, there were more than 6,850 MOOCs being offered by 700 universities as of December 25, 2016 (Shah, 2016). This data is presented in Figure 1.

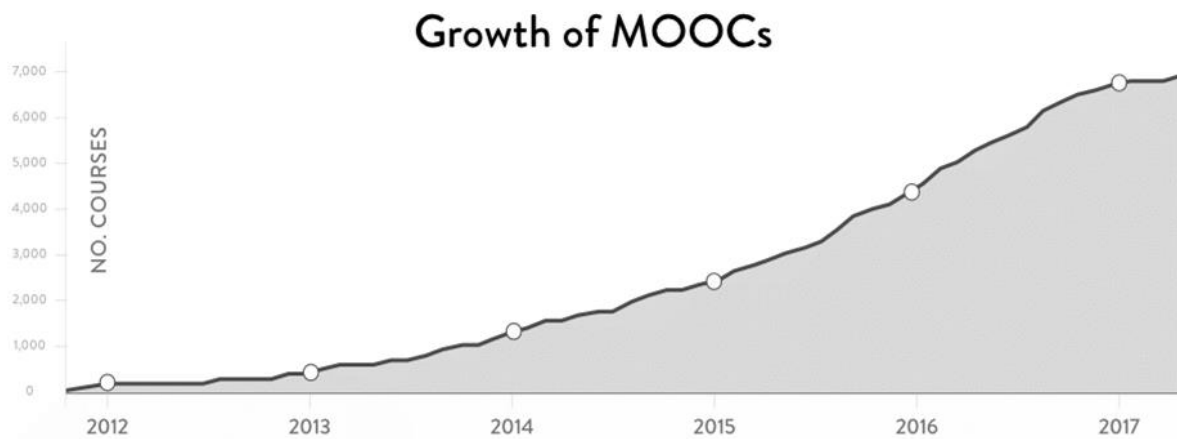


Figure 1. Growth of MOOCs as presented by Shah (2016). From “By the numbers: MOOCs in 2016,” D. Shah, 2016 (<https://www.class-central.com/report/mooc-stats-2016/>). In the public domain.

Although the emergence of MOOCs has fueled much attention among researchers and educators around the world, our understanding of student engagement in these large open online courses is still limited (Anderson, Huttenlocher, Kleinberg, & Leskovec, 2014). Compared to conventional online courses, the task of engaging students in large-scale open online learning environments is often more challenging (Hew, 2016). In conventional online courses, learners usually share the same academic goals, are familiar with one another, and are supervised closely by the teacher (Chiu & Hew, 2018). However in MOOCs, learners do not know most of their peers, are not supervised by the teacher, and are under no expectation to complete the course (Chiu & Hew, 2018).

The main purpose of this study was to identify which aspects of MOOCs participants found engaging, by analyzing a large data set of participant qualitative comments. More specifically, we set out to offer a new contribution by testing a set of five machine learning automatic classification models (k-Nearest Neighbors, Gradient Boosting Trees, Support Vector Machines, Logistic Regression, and Naïve Bayesian). The best performing model was employed to analyze 24,612 reflective sentences posted by 5,884 students, who participated in one or more of 18 highly rated MOOCs. To the best of our knowledge, this is the first work that mobilized a repertoire of analytical and technological resources in the fields of text data mining and machine learning to analyze a large dataset of MOOC students’ reflective comments. The scalable algorithmic approach in machine learning freed up human labor, and enabled us to analyze large data corpus at a scale that would be infeasible by human annotations.

Before explaining our use of the machine learning automatic classifier in detail, we first describe the aspects of a technology-based environment, which may aid in student engagement, by using the framework of engagement theory (Kearsley & Schneiderman, 1998). Second, in the Literature Review section, we provide a brief review of previous MOOC research, followed by a discussion of the current research gaps regarding student engagement in MOOCs. Third, in the Method section, we explain in detail how we selected 18 highly rated MOOCs, collected participant reflective comments of these MOOCs, and analyzed the comments. Finally, we present the results, followed by the discussion and conclusion.

## Engagement Theory

Student engagement may take many forms, such as attending classes (behavioral engagement), asking questions (cognitive engagement), and/or expressing enjoyment towards the course activities or instructors (emotional engagement; Fredricks, Blumenfeld, & Paris, 2014).

One frequently cited theory that serves as a useful conceptual framework to understand teaching and learning in a technology-based environment is Engagement Theory (Kearsley & Shneiderman, 1998). Engagement theory posits three primary elements to accomplish student engagement: (a) Relating, (b) Creating, and (c) Donating. The role of technology in this theory is to help facilitate engagement in ways that may be difficult to achieve otherwise (Kearsley & Shneiderman, 1998).

The first element, *Relating*, emphasizes peer interaction whereby students exchange ideas or opinions with other students, enabling learners from different backgrounds to learn from one another (Kearsley & Shneiderman, 1998). The second element, *Creating*, refers to the “application of ideas to a specific context” (Kearsley & Shneiderman, 1998, p. 20), such as students discussing a case study on a wiki (Hazari, North, & Moreland, 2009). The third element, *Donating*, refers to the use of authentic learning environment that has strong connections to the real world (Kearsley & Shneiderman, 1998). This principle is particularly valuable for adult learners, who expect immediate application of knowledge learned in class. By accomplishing authentic tasks, students can transfer in-class content and see the immediate implementation of this knowledge (Kearsley & Shneiderman, 1998). The authenticity of a task can boost students’ satisfaction and motivation (Keller, 1987). Since its inception, engagement theory has been referred to in a variety of conventional online education contexts (Beldarrain, 2006; Bonk & Wisner, 2000; Hazari et al., 2009; Knowlton, 2000; Sims 2003). However, hitherto, engagement theory has not been used to analyze how MOOCs engage participants. As within a conventional e-learning course, learning in MOOCs also happens online. However, as previously explained, MOOCs and conventional e-learning courses are dissimilar in their nature. MOOCs are characterized by free access, and massive open participation. Students can choose to enroll or drop out of MOOCs at any time they wish without incurring any penalty. Do the elements espoused in Engagement theory also apply to MOOC-specific contexts? Which element (i.e., relate, create, donate), if any, is considered most engaging by MOOC students? What additional elements are considered engaging to MOOC students? Answers to these questions can help enrich our understanding of MOOC engagement as well as extend our perspective of Engagement Theory.

## Literature Review

In this section, we provide a brief review of previous MOOC studies. This is followed by a discussion of the current knowledge gaps pertaining to student engagement in MOOCs.

Currently, most previous research studies on MOOCs can be parsimoniously grouped into five major categories: (a) impact of MOOCs on institutions, (b) student motives for signing up for MOOCs and reasons for dropping out, (c) instructor motives and challenges of teaching MOOCs, (d) click-stream analysis of log data, and (e) types of MOOCs. Each of these categories will be briefly discussed in the following paragraphs.

The advent of MOOCs has caused concerns to many universities and libraries. Gore (2014), for example, examined the new challenges faced by librarians in light of MOOCs, and discussed a number of challenges that librarians may face as MOOCs become more widespread. These challenges include licensing and copyright, and delivering remote services. Lombardi (2013) examined the types of decisions undertaken by Duke University, an institution which attempted to capitalize on the opportunities and challenges presented by MOOCs. . Decisions revolved around questions such as how well does partnership with Coursera (a MOOC platform provider) align with the University's academic goals, and how might this partnership promote a sustainable model to advance open education as a social good?

Hew and Cheung (2014) reviewed 25 studies to understand the motivation and challenges of instructors' and students' use of MOOCs. Their study revealed four main reasons of student motives for signing up for a MOOC, including the wish to learn something new, to expand existing knowledge reservoir, to challenge themselves, and to get a MOOC completion certificate. Reasons for students dropping out include difficulty in understanding the subject material, insufficient support, and having other priorities over the course.

Instructors' motives for teaching MOOCs include the desire to enhance their professional reputation, to provide opportunity for students around the world to access their courses (Kolowich, 2013). Challenges of teaching MOOCs include lack of student feedback, lack of online forum participation, and heavy burden of time and effort in developing and implementing the MOOCs (Hew & Cheung, 2014). In a study by Baxter and Haycock (2014) regarding MOOC online forum participation, most students only posted intermittently in the online forum. Those who considered themselves frequent contributors only accounted for about 6% of 1,000 randomly selected students (Baxter & Haycock, 2014).

Other studies used click-stream data to investigate student online activities during MOOCs. For example, previous studies found that more students watched videos than worked on course assignments, and that the number of student participation deteriorated steadily as the weeks progressed (Coffrin, de Barba, Corrin, & Kennedy, 2014). Previous studies also found that frequency of forum postings and quiz attempts positively correlated with student MOOC grades (Coetzee, Fox, Hearst, & Hartmann, 2014; de Barba, Kennedy, & Ainley, 2016). Other studies attempted to propose models or methods to predict MOOC dropout (Kloft, Stiehler, Zheng, & Pinkwart, 2014).

Finally, other scholars focused on examining the different types of MOOCs. Essentially, MOOCs can be parsimoniously classified into either xMOOCs or cMOOCs. xMOOCs follow a cognitive-behavioral approach (Conole, 2013), while cMOOCs are modeled after the notion of connectivism (Daniel, 2012; Rodriguez, 2012). xMOOCs typically come with a syllabus, a course content that consists of readings, discussion forums, assignments (e.g., quizzes, projects), and pre-recorded instructor lecture videos (Hew & Cheung, 2014). The syllabus, course content, readings, forums and assignments in xMOOCs are predefined by the instructors before the commencement of the course (Hew & Cheung, 2014). In cMOOCs, however, students define the actual course contents as the course progresses, and there is no fixed syllabus

(Rodriguez, 2012). Participants organize their own learning according to different learning goals, and to interact with others, while an emphasis is placed on personalized learning through a personal learning environment (Conole, 2013; Rodriguez, 2012). This could result in more than one topic being examined concurrently (Hew & Cheung, 2014).

## Research Gaps

Although the aforementioned studies have provided us with a useful understanding of MOOCs, they fall short of explaining the reasons why participants find a course or certain parts of a course engaging. Many researchers have begun questioning the validity of using traditional metric such as completion or dropout rate to measure whether a MOOC is engaging or not. As previously described, MOOCs are open courses that are usually offered free of charge, and learners who sign up are under no obligation whatsoever to complete the course. Due to time constraints and work commitment, learners may only complete certain course activities (Kizilcec, Piech, & Schneider, 2013) and still find the activities engaging.

Therefore, in order to understand which aspects of MOOCs students find engaging, we need to analyze students' reflective comments about the MOOCs. So far to the best of our knowledge, only two studies were found that focused specifically on student reflection data of MOOCs. Hew (2015) analyzed guidelines of improving the quality of online teaching and learning from four professional councils, as well as qualitatively analyzed 839 participants' comments of two highly rated MOOCs using the grounded approach. By synthesizing the policy guidelines and actual opinions of online learners, Hew (2015) proposed a rudimentary model of engaging online students, covering six dimensions: course information, course resources, active learning, interaction, monitoring of learning, and making meaningful connections. The findings of this study show us an emerging picture of what is valued by MOOC students.

Another grounded approach study analyzed 965 course participants' reviews on three top-rated MOOCs in the subjects of literature, arts and design, and programming language to find out what factors about the course engaged students, and contributed to their favorable consideration of the online learning experience (Hew, 2016). Five factors were listed: problem-centric learning, instructor accessibility and passion, active learning, peer interaction, and helpful course resources. This study set a foundation of what are worthwhile factors to consider when instructors prepare and deliver a MOOC.

The limitation of these two study lies in the fact that only two or three MOOCs were inspected respectively, which, as the author noted, is not sufficient to warrant strong conclusions (Hew, 2016). Nevertheless, the results of these two studies provide a useful conceptual basis for other researchers to conduct studies to examine students' reflection comments.

## Method

This study aims to answer the following question: What elements pertaining to the course design or the instructor did students find enjoyable, helpful in learning the materials, or motivational (motivating them to take part in the activities)? In this section, we explain how we chose the 18 highly rated MOOCs, collected the MOOC participants' reflective comments, and analyzed the comments. An overview of the whole data collection, processing, and analysis procedure is shown in Figure 2.

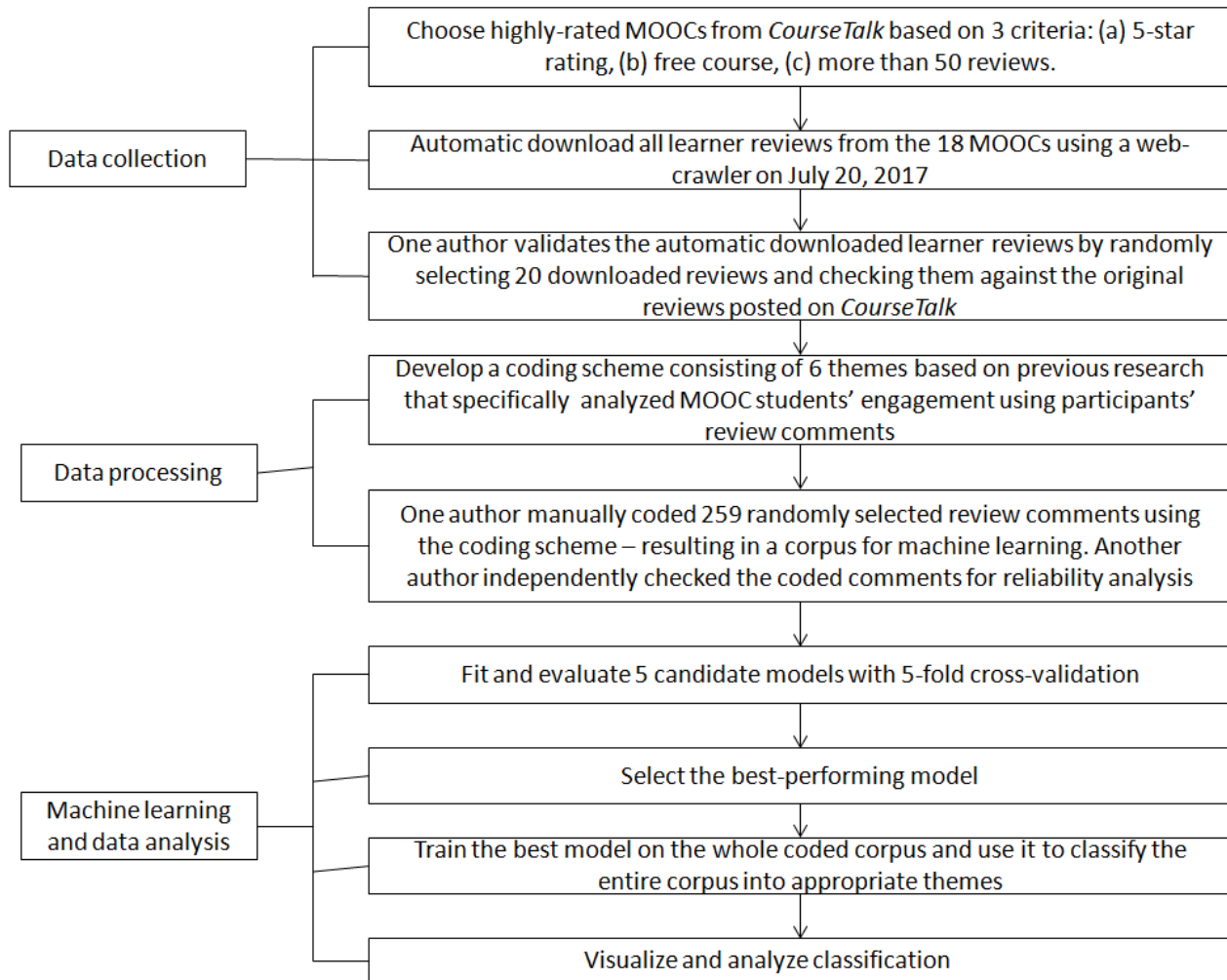


Figure 2. Overview of the method.

## Data Collection

Highly rated MOOCs were sampled because they exemplified good practice or teaching strategies. We selected “highly rated” MOOCs from *Coursetalk*, an open user-driven aggregator and discovery website that allows students to search and review various MOOCs. We defined a highly rated MOOC as a course that received an overall five-star course quality rating, and received at least 50 reviews (from different learners) within a particular subject discipline. Using reviews from many different participants provided data triangulation, which promotes trustworthiness of the ratings (Shenton, 2004).

*Coursetalk* was chosen because it is considered the largest platform connecting learners to courses (Business Wire, 2014). When this study was conducted, it listed more than 50,000 courses. Visitors to the website can rate a course from three dimensions: course content, course instructor, and course provider. One to five stars can be given, with five stars being the highest quality. The website will calculate an individual user’s rating across the three categories, and further aggregate an overall rating among all participants. Therefore, a course will have a general rating score, as well as a detailed list of ratings from specific participants. In addition, participants can write down review comments.

Using data from *Coursetalk*, we searched all 282 subject disciplinary areas, and applied the following selection criteria to identify eligible student reviews: free of charge, rated five-star, and with more than 50 reviews. As of July 20, 2017, 18 highly rated MOOCs were identified. We provide an overview of the 18 MOOCs in Table 1.

One of the authors wrote a web crawler to automatically download all the reviews of the 18 MOOCs. Given the URLs of the 18 course pages, the crawler was launched at 9:46 p.m. on July 20<sup>th</sup>, 2017 and obtained a total of 5,884 learners' reflective posts, with 24,612 sentences generated on or before that day. Of the 5,884 learners, 90.9% completed one or more MOOCs, 8.3% were currently taking a MOOC, and 0.8% were drop outs. Once the entire data had been downloaded, another researcher randomly selected 20 of the downloaded reviews and checked them against the original reviews posted on *CourseTalk*. This procedure served to establish the reliability of the data collection process. The percent agreement was 100%.

Table 1

*MOOCs Reviewed in This Study*

	Subject discipline area	MOOC title	University	Ratings and number of reviews	Purpose of the course
1	Computer sciences	An Introduction to Interactive Programming in Python	Rice University	5*, 3077 reviews	Develops simple interactive games (e.g., Pong) using Python.
2.	Social sciences	The science of everyday thinking	The University of Queensland	5*, 1167 reviews	Explores the psychology of our everyday thinking, such as why people believe weird things, and how we can make better decisions.
3.	Natural sciences	The science of the solar system	Caltech	5*, 303 reviews	Explores Mars, the outer solar system, planets outside our solar system, and habitability in our neighborhood and beyond.
4.	Environmental sciences	Introduction to environmental science	Dartmouth College	5*, 233 reviews	Surveys environmental science topics at an introductory level, ultimately considering the sustainability of human activities on the planet.
5.	Design	Design: creation of artifacts in society	University of Pennsylvania	5*, 217 reviews	Focuses on the basic design process: define, explore, select, and refine. Weekly design challenges test student ability to apply those ideas to solve real problems.
6.	Literary art	Modern and contemporary American poetry	University of Pennsylvania	5*, 171 reviews	Introduces modern and contemporary U.S. poetry, with an emphasis on experimental verse, from Dickinson and Whitman to the present.



7.	Cybersecurity	Cybersecurity fundamentals	Rochester Institute of Technology	5*, 168 reviews	Introduces essential techniques in protecting systems and network infrastructures, analyzing and monitoring potential threats and attacks, devising and implementing security solutions.
8.	Statistics	The analytics edge	Massachusetts Institute of Technology	5*, 149 reviews	Explores the use of data and analytics to improve a business or industry.
9.	Management	Finance: time value of money	n.a.	5*, 90 reviews	Introduces the logic of investment decisions and familiarize with compounding, discounting, net present value, and timeliness.
10.	Computer sciences	HTML5 coding essentials and best practices	The World Wide Web Consortium (W3C)	5*, 84 reviews	Explains the new HTML5 features to help create great Web sites and applications in a simplified but powerful way.
11	Management	u.lab: leading from the emerging future	Massachusetts Institute of Technology	5*, 82 reviews	Introduces a method called Theory U, developed at MIT, for leading changes in business, government, and civil society contexts worldwide.
12.	Art and culture	Drawing nature, science and culture: natural history illustration 101	The University of Newcastle, Australia	5*, 81 reviews	Introduces essential skills and techniques that form the base for creating accurate and stunning replications of subjects from the natural world.
13	Biology	Introduction to biology-the secret of life	Massachusetts Institute of Technology	5*, 75 reviews	Explores the mysteries of biochemistry, genetics, molecular biology, recombinant DNA technology and genomics, and rational medicine.
14.	Literary art	Comic books and graphic novels	University of Colorado Boulder	5*, 75 reviews	Presents a survey of the Anglo-American comic book canon and of the major graphic novels in circulation in the United States today.
15.	Social sciences	Justice	Harvard University	5*, 68 reviews	Explores critical analysis of classical and contemporary theories of justice, including discussion of present-day applications.
16.	Computer sciences	Mobile computing with app inventor—CS principles	Trinity College	5*, 51 reviews	Explains the open development tool, <i>App Inventor</i> , to program on Android devices, and some of the fundamental principles of computer science.
17	Social sciences	International human rights law	Université catholique de	5*, 51 reviews	Examines a wide range of topics including, religious

			Louvain		freedom in multicultural societies, human rights in employment relationships, etc.
18	Environment	Climate change: the science	University of British Columbia	5*, 50 reviews	Introduces climate science basics such as flows of energy and carbon in Earth's climate system, how climate models work, climate history, and future forecasts.

## Data Processing

To train the machine learning algorithm, we first developed a coding scheme consisting of the following six themes based on previous grounded approach studies that specifically analyzed MOOC students' engagement using participant review comments (Hew, 2015; 2016). These themes, which are not listed in order of importance or priority included:

- Theme 1: Structure and pace,
- Theme 2: video,
- Theme 3: instructor attributes,
- Theme 4: content and resources,
- Theme 5: interaction or community, and
- Theme 6: assignment and assessment.

Table 2

### *Themes and Descriptors*

Theme	Descriptors
Structure and Pace	Clear objective, duration, structure and syllabus
Video	Videos, captions, choice of speed variation, video-integrated quiz
Instructor attributes	Instructor knowledge, instructor passion, instructor humor
Content and resources	Examples or case studies that relate to the real world, problem-solving centric, relevant and up-to-date course content and resources, Availability of transcript and pdf documentation, slide notes
Interaction and support	Student-student interaction, instructor-student interaction, course support
Assignment and assessment	Use of active learning strategies such as mini-projects, exercises, quizzes, questions, feedback

To fulfill the training purpose, an annotated "instructional" dataset is required to form the training materials, consisting of positive and negative cases, on which the automatic machine classifiers "learn" through adapting their model parameters to fit the dataset. A sample of sentences (259) were randomly extracted from the newly collected dataset, and human raters were recruited to manually label these texts using the aforementioned theme labels. One human rater independently labeled the texts using the labels. This was then independently examined by another human rater. Discrepancies among the raters were resolved through discussion.

For example, 25 positive cases of Theme 6 "Assignment and Assessment" were annotated by the human rater, and they were used to train the automatic classifiers. In the training process, the computer might automatically learn that positive cases of this theme may contain certain linguistic cues such as: "(+) quiz" or

“(+) task.” When the machine analyzed the data independently afterwards, if a case contained “(+) quiz” or “(+) task”, most likely the computer would classify it into “Assignment and Assessment”. For example, the comment “the quizzes are detailed and complete and require a bit of extra programming and the mini-project and peer reviews require a few hours of extra effort” was classified as positive within this theme. In the meanwhile, other cases without these cues were possibly considered negative.

To simplify the problem in our scenario, we leveraged the one-versus-the-rest treatment (Bishop, 2006, p. 182) for multi-label classification task, and decomposed the problem into six binary classification tasks, each of which corresponds to a specific theme. To explain, using the one-versus-the-rest treatment, we trained six independent classifiers for the six themes. One classifier could only decide whether a case was positive or negative under the corresponding theme. In other words, it only focused on one theme and did not consider other themes. The six classifiers were adopted independently to process the same data corpus. Note that in our case, the theme labels were not exclusive, hence we were free from the issue of ambiguous classification regions proposed in Bishop (2006, pp. 182-183).

However, regarding a single theme, the fact that all its non-positively-labeled cases were taken as negative cases greatly enlarged the proportion of negative-to-positive data ratios, resulting in data unbalance. To counteract the data unbalance, we conducted data expansion for positive samples in each theme class. Specifically, we extracted all sentences in the rest of the corpus containing the theme-dependent cue terms in a term list (summarized by the annotators). Immediately after that, the annotators checked the new data and removed wrong samples. The sampling and validation procedure repeated until the new cases were all valid. The statistics for the dataset for each theme before and after data expansion are summarized in Table 3. As a result of the data expansion procedure, the sub corpus for each theme was balanced.

Table 3

*Annotated Corpus Statistics Before and After Data Expansion*

	Theme 1	Theme 2	Theme 3	Theme 4	Theme 5	Theme 6
Positive samples before expansion	37	28	68	78	36	25
Negative samples before expansion	222	231	191	181	223	234
Corpus size after expansion	444	462	382	362	446	468

## Data Analysis and Testing of Models

The machine learning goal in our scenario can be formalized as follows. The objective is to fit a series of binary classifiers  $\mathbf{f} = [f_1, \dots, f_N]$  (where  $f_i$  corresponds to the  $i$ th theme, and  $N=6$  is the number of themes) on the annotated dataset  $D$ , and then apply  $\mathbf{f}$  to predict theme labels on the rest texts. Given a text  $\mathbf{x}$  and the trained classifiers  $\mathbf{f}$ , the themes of  $\mathbf{x}$  are predicted as  $\mathbf{y} = \mathbf{f}(\mathbf{x}) = [f_1(\mathbf{x}), \dots, f_N(\mathbf{x})]$ , where  $\mathbf{y} \in \{1,0\}^N$  is a  $N$ -dimensional vector of zeros and ones with the  $i$ th dimension indicating whether the  $i$ th theme is assigned to the text. Values 1 and 0 in  $\mathbf{y}$  designate true and false respectively.

As the data representation building block, the design matrix (Murphy, 2012, p. 2) in our context is implemented with TF-IDF features, i.e., a matrix of which columns and rows represent terms and documents respectively, and each cell in the matrix records a value computed on the frequency of the term in the document (measuring its degree of popularity within the document), weighted by the term's inversed document frequency (measuring its degree of rarity in the whole corpus) (Wu, Luk, Wong, & Kwok, 2008). TF-IDF is a common technique of text representation and can filter out stop words and keep the most discriminant terms (Robertson, 2004).

On the other hand, due to what has been claimed in the *no free lunch theorem* (Box & Draper, 1987, p. 424), we could not guarantee a best performed classification model type beforehand, since there is not a best model which can outperform all the other models on all problems. As a result, we prepared a set of candidate model types and expected to find the best performing one. The candidate classifiers included:

1. k-Nearest Neighbors (KNN) (Altman, 1992),
2. Gradient Boosting Trees (GBT) (Friedman, 2001),
3. Support Vector Machines (SVM) (Cortes & Vapnik, 1995),
4. Logistic Regression (LR) (Cox, 1958), and
5. Naïve Bayesian (NB) (Murphy, 2012).

To evaluate the classification performance in a comprehensive stance, we adopted five metrics. In these metrics, the first four measurements are calculated on the confusion matrix (Stehman, 1997), which records predicted labels and ground truths and is primarily for measuring correctness from different angles. The kappa value (Cohen, 1960) measures the classification consistency between the learning classifiers and the human annotators:

1. Accuracy: the proportion of correct predictions (both positive and negative) in all cases;
2. Precision: the proportion of correct predictions in all cases predicted as positive.
3. Recall: the proportion of true positive cases predicted as positive in all true positive cases;
4. F1: the harmonic mean of precision and recall, which balances the measurements of 2) and 3)
5. Cohen's kappa: the agreement between two raters (the machine trained classifier and human annotators in our scenario (Cohen, 1960)).

We implemented the machine learning and evaluation experiment using Python programming language. The classifiers were implemented with the Scikit-learn package<sup>i</sup>, and the texts were segmented, tokenized and cleaned with the spaCy<sup>ii</sup> natural language processing toolkit, before the design matrix was constructed via the Scikit-learn TF-IDF feature extraction tool.

The experiment was conducted on an Ubuntu16.04 system equipped with Intel Core i5-4460 3.20GHz CPU and 16GB memory. We arranged five-fold cross-validation (Bishop, 2006, p. 33) for each classifier on each theme, so that each classifier on each theme obtained five test scores on each metric. Finally, the metric scores were averaged, and the best performed classifiers on each metric and each theme identified (Table 4).

Table 4

*Best Performing Automatic Machine Learning Classifiers on Each Theme*

	Theme 1	Theme 2	Theme 3	Theme 4	Theme 5	Theme 6
accuracy	GBT	GBT	GBT	GBT	GBT	SVM
precision	NB	SVM	LR	LR	LR	NB
recall	KNN	KNN	KNN	KNN	KNN	KNN
f1	GBT	GBT	GBT	GBT	GBT	SVM
kappa	GBT	GBT	GBT	GBT	GBT	GBT

In general, the candidate classifiers performed differently in different metrics and for different themes. Whereas, the GBT classifier performed better than all the other classifiers on kappa metrics, demonstrating its superb consistency with the human annotators. The same classifier was also good in f1 scores, meaning that it was relatively balanced in precision and recall. Finally, GBT was very accurate in making positive and negative predictions, with the accuracy score outperforming most of the other classifiers except for Theme 6. Due to its stable and superb performance, we selected GBT as the prediction model for later use. Table 5 presents the performances of GBT.

The GBT achieved sound values in accuracy, f1, precision and recall. In addition, its kappa values were all above 0.61, indicating its substantial agreement with human annotators (McHugh, 2012). All the metrics demonstrate the promising quality of the classifier.

Table 5

*Performance Metrics for GBT*

	Theme1	Theme2	Theme3	Theme4	Theme5	Theme6
accuracy	0.8079	0.9630	0.8289	0.8056	0.8467	0.8991
precision	0.7868	0.9820	0.8773	0.8625	0.8967	0.9148
recall	0.8464	0.9435	0.7684	0.7333	0.7836	0.8845
f1	0.8152	0.9623	0.8171	0.7894	0.8361	0.8980
kappa	0.6158	0.9261	0.6579	0.6111	0.6934	0.7982

## Results

### Full Dataset Prediction and Analysis

Adopting the GBT classification model, we trained six GBT classifiers for each of the six themes, and used them to classify the remaining texts according to the appropriate theme categories. Figure 3 shows how frequently each theme was found in the participants' reflective sentences; the more frequent a certain theme was mentioned in the participants' reflective comments, the bigger the circle size of the theme. Figure 3 also indicates how likely each theme co-occurred with other theme (mentioned together by the participants); the closer the distance between the themes are shown in Figure 3, the more likely they are mentioned together by

the participants. The distances between the themes shown in Figure 3 were not designed a priori to the analysis. To explain how the distance between themes was computed, we provide the following illustration.

Suppose we have the following text: "The exercises are related to the videos and allow the student to progress week after week". This text was inferred correctly by the automatic classifiers to contain Theme 2 (Video) and Theme 6 (Assignment and assessment). The results were then represented with a vector with six dimensions (6-D) indicating the existence or nonexistence of six themes. In this case, the example text would be marked with a 6-D vector (0, 1, 0, 0, 0, 1), representing Theme 1 (leftmost) to Theme 6 (rightmost), where each position represents whether the theme is on (using 1) or off (using 0). In our example, the 2<sup>nd</sup> and 6<sup>th</sup> dimensions of the vector were turned on (using 1), indicating the text contained Theme 2 and Theme 6. The other themes (i.e., Themes 1, 3, 4, 5) were turned off (using 0). Now assuming we have the following results from Texts 1 to 4 (Table 6):

Table 6

*Examples of Texts and Themes*

Text	Theme1	Theme2	Theme3	Theme4	Theme5	Theme6
Text 1	1	1	1	0	0	0
Text 2	0	1	0	0	0	0
Text 3	0	1	1	1	0	0
Text 4	1	1	1	0	0	0

We find that Themes 2 and 3 are more likely to co-occur (they co-occurred in Texts 1, 3, 4), so we could consider Themes 2 and 3 as more inclined to be semantically closer than the other themes. Moreover, we can find that the closeness could be measured by the similarity of the columns of the themes in the above matrix. The Theme 2 column, which is (1,1,1,1) is only one bit different from Theme 3 column, i.e., (1,0,1,1).

Below we give an example showing how we can calculate theme distances via their column vectors. We denote  $\mathbf{a}$ ,  $\mathbf{b}$  to be any column vectors of two themes in Table 6, then using the formula of Euclidean distance metric (which can be used to compute the distance of two vectors), the distance of  $\mathbf{a}$ ,  $\mathbf{b}$  can be computed as:  $\text{dist}(\mathbf{a}, \mathbf{b}) = \sqrt{((\mathbf{a} - \mathbf{b})^T (\mathbf{a} - \mathbf{b}))} = \sqrt{((a_1 - b_1)^2 + (a_2 - b_2)^2 + \dots + (a_N - b_N)^2)}$ , where  $a_i, b_i$  ( $i = 1, 2, \dots, N$ ) are the  $i$ th elements of the column vectors  $\mathbf{a}$  and  $\mathbf{b}$  respectively,  $\sqrt{(\cdot)}$  is the square root function, and  $N$  is the dimension of the column vectors ( $N = 4$  in our example, since we have only 4 texts). We can compute the distance between Theme 2 and Theme 3, and other themes, using the above formula, and obtain for example:

$$\begin{aligned} \text{dist}(\text{Theme2}, \text{Theme3}) &= \sqrt{((1 - 1)^2 + (1 - 0)^2 + (1 - 1)^2 + (1 - 1)^2)} = \sqrt{(0 + 1 + 0 + 0)} = 1, \\ \text{dist}(\text{Theme2}, \text{Theme5}) &= \sqrt{((1 - 0)^2 + (1 - 0)^2 + (1 - 0)^2 + (1 - 0)^2)} = \sqrt{(1 + 1 + 1 + 1)} = 2, \\ \text{dist}(\text{Theme2}, \text{Theme1}) &= \sqrt{((1 - 1)^2 + (1 - 0)^2 + (1 - 0)^2 + (1 - 1)^2)} = \sqrt{(0 + 1 + 1 + 0)} \approx 1.414, \end{aligned}$$

Therefore, we can see that the vector of Theme 2 is closer to Theme 3 than to Themes 1 and 5. So when two themes are more likely to co-occur (mentioned together in the participants' comments), their column vectors are closer.

To make it possible to visualize the high-dimensional theme vectors, we conducted Principle Component Analysis (PCA) (Wold, Esbensen & Geladi, 1987) for the matrix and managed to reduce and project the column vectors into two-dimensional space, as presented in Figure 3. Note that PCA not only projects the vectors into the 2-D space, but also maximally keeps the vector closeness information in the original high dimensional space. With the 2-D coordinates yielded by PCA, we are able to draw the themes on x-y axis and generate Figure 3.

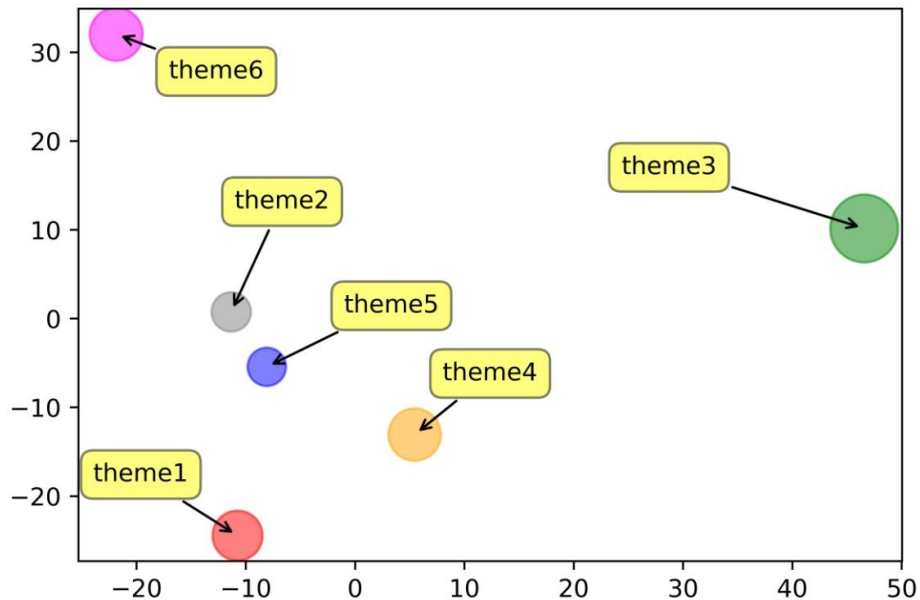


Figure 3. Visualization of the relatedness of the themes. Circle size is proportional to the percentage of the theme in the corpus, and the distances between circles indicate their relatedness in terms of co-occurrence.

It is beyond the length of this paper to list out every single student comment related to each of the seven themes. We therefore provide some representative examples to provide the reader with a closer look at each of the six themes (see Table 7). The main findings can be summarized as follows:

- a) The most frequently mentioned theme was instructor attributes. The other commonly mentioned themes were course content and resources, assignment and assessment, and structure and pace.
- b) Two particular instructor attributes stood out among the many student comments: instructor's passion about the subject as well as teaching it, and instructor's sense of humor.
- c) Students enjoy course content and resources that emphasized real-world application or problem-solving.
- d) Students desire moderately challenging courses assignments that require them to apply the contents learned. Easy assignments or questions that merely test factual recall are disliked. Assignments that are fun and enjoyable (e.g., building simple games) make the tasks more engaging to students.
- e) Student prefer short lecture videos ranging from about five to ten minutes long. Videos consisting of different instructors were perceived to be more engaging. Guest speakers' appearances in videos are generally welcomed and appreciated by students.
- f) Use of in-video quizzes helps sustain students' attention to lecture content.
- g) Students prefer a course structure that builds on each lesson progressively from simple to difficult, and provides options for students to do either the minimum or go deeper into the subject.

Table 7

*Themes and Examples of Students' Comments*

Theme	Examples of students' comments
1. Structure and pace	<ul style="list-style-type: none"> <li>• A very well paced course, with a well thought progression from easy to more difficult.</li> <li>• They provide you with a very structured sequence of steps that make it possible to do what seems like impossible at first.</li> <li>• There is room to do just the minimum, which is good for many, or go a bit deeper.</li> <li>• One has the option of doing the homework that the CalTech students are doing.</li> <li>• The course started slowly and each week builds on the last; very good pace to learn.</li> </ul>
2. Video	<ul style="list-style-type: none"> <li>• The video lectures were nice bite sized pieces that I could do on my commute or lunch hour, and re-watch if needed.</li> <li>• The video lectures are very interesting, usually in very short chunks with plenty of examples, demonstrations etc, so it's easy to understand the principle being taught.</li> <li>• I like the short video segments - usually 1-2 main concepts taught.</li> <li>• The video segments were engaging and kept to around 5 minutes each, which allow you to come and go to the class easily.</li> <li>• Having 3 different lecturers every week is quite useful as they do have different teaching styles.</li> <li>• I especially like to in-video quizzes that are auto-graded.</li> <li>• These in-video quizzes help minimize mind-wandering; they also test the concepts or ideas taught to help me remember and understand them better.</li> </ul>
3. Instructor	<ul style="list-style-type: none"> <li>• Instructors are obviously very passionate about the topic and have spent a lot of time preparing information for this course!</li> <li>• I also liked the added humor in the lectures to avoid the material from becoming dull.</li> <li>• The instructors enjoy teaching the class so that makes the class easy to immerse yourself into.</li> <li>• The teacher teaches with passion and encourages his students.</li> <li>• All professors have some good sense of humor that makes the learning fun!</li> <li>• His [the instructor] enthusiasm is contagious and it helped to motivate me to complete the quizzes</li> </ul>
4. Content and resources	<ul style="list-style-type: none"> <li>• Lander [the instructor] provided multiple real world examples (diseases, court cases, discoveries made in the last decade) that made the material very relevant and modern.</li> <li>• Every discussed concepts of machine learning field was accompanied with real world problems and solutions.</li> <li>• We learned how to apply a design process to solve problems we saw in the world around us.</li> <li>• It is the only course of which knowledge can easily be applied to the real world.</li> <li>• There are actual field trips to power plants, water plants, and farms that help make the material real.</li> <li>• I like the combination of video, transcript and pdf documentation to allow students to review.</li> <li>• The way this class is taught helps all types of learners by having transcripts, captions and videos.</li> </ul>



Theme	Examples of students' comments
5. Interaction and support	<ul style="list-style-type: none"> <li>• The support provided for this class is also very sufficient, with a forum, code clinic, support email and the TA who work very hard to try and help out in the forum.</li> <li>• The special activities like live webcasts and facebook interactions from the instructor and TAs provide an extra feeling of connectedness and commitment.</li> <li>• I also really appreciated his [instructor] and his team's direct interaction with students.</li> <li>• The course has a great support group with message boards, TA's, and instructors who are fully invested in helping you learn.</li> <li>• There is also a "code clinic" where the staff provides more direct help to the students.</li> </ul>
6. Assignment and assessment	<ul style="list-style-type: none"> <li>• The problem sets were very helpful and challenged me to think logically and apply the material in real world kind of ways.</li> <li>• The exercises made you think and were challenging enough to keep ones interest up.</li> <li>• Progressive weekly assignment that are specifically designed to help students understand concepts taught in lecture.</li> <li>• Small questionnaires that arise at the end of each topic or end of each workweek are very good because they allow us to see which subject we lacked a better understanding and thus focus on it.</li> <li>• Marking scheme for each assignment is clear and easy to understand most of the time.</li> <li>• It was very helpful to have a short "check your understanding" multiple choice questionnaire after each section.</li> </ul>

## Discussion

It is interesting to note that all 18 MOOCs can be classified as xMOOCs. To briefly recall, xMOOCs typically come with a syllabus, a course content that consists of readings, discussion forums, assignments (e.g., quizzes, projects), and pre-recorded instructor lecture videos (Hew & Cheung, 2014). The syllabus, course content, readings, forums and assignments in xMOOCs are predefined by the instructors before the commencement of the course (Hew & Cheung, 2014). The results of the present study demonstrate that xMOOCs, which come with a clear instructor-defined course structure, are perceived more positively than cMOOCs by students. Students appreciate a course structure with a well thought progression of pace from easy to more difficult as the weeks advance.

Overall, the most frequently mentioned themes that participants perceived as engaging were instructor attributes. The most common means for an instructor to present course materials in a MOOC is through lecture videos (Young, 2013). Even though instructors may feel awkward being on videos, they can still engage students if they are excited or enthusiastic about the subject matter (Young, 2013). An instructor's enthusiasm for teaching the subject can help break the boredom of watching videos, and even motivate students to complete the activities, as indicated in student feedback : "His [the instructor] enthusiasm is contagious, and it helped to motivate me to complete the quizzes." (Student)

As indicated in student feedback, students also value an instructor's humor because it helps break the boredom and make the lesson more enjoyable, as shown in the following student comments. Use of humor can help arouse students' attention, increase student liking of the professor, establish a positive rapport with

students, and motivate students to participate in the course (Wanzer, 2002): “Their geek sense of humor helped the classes be very interesting and enjoyable” (Student) and “I also liked the added humor in the lectures to avoid the material from becoming dull” (Student).

Course content and resources that emphasized real-world application or problem-solving were other themes that participants perceived as engaging. As outlined by Dillahunt, Wang, and Teasley (2014), a majority of MOOC learners are adult learners who have at least a bachelor’s degree and are employed. Adult learners will be more engaged in learning when new content that is presented is applicable to real-life situations (Knowles, Holton, & Swanson, 2011). This finding implies that instructors should emphasize application of content to real-world practices over mere transmission of information. Instructional strategies such as showing real-life problems to which the principles or solutions taught in the course can be applied, and presenting practical tips are particularly useful because these elements provide valuable add-on insights to students’ learning. In addition, instructors should provide text-based resources such as video transcripts, video captions, and pdf documentations to help students review the course content.

Interestingly, despite the commitment-free nature of MOOCs (e.g., no actual course credit or course fees), students still desire moderately challenging courses assignments that require them to think or apply the concepts or principles learned. One possible explanation for this may be offered by the achievement goal theory. According to achievement goal theorists, there are two main types of goals: (1) the performance goal, which focuses on exhibiting ability in comparison with other people; and (2) the mastery goal, which focuses on developing competence in a particular topic or area (Ames, 1992; Meece, Blumenfeld, & Hoyle, 1988). Since learners in a MOOC do not know most of their peers, it is unlikely that they are motivated by performance goals. We posit therefore that learners in MOOCs are more likely to be motivated by mastery goals. Adopting a mastery goal is believed to produce a desire for moderately challenging tasks, a positive stance toward learning, and enhanced task enjoyment (Elliot & Church, 1997). The implication here is that instructors should avoid simple assignments that merely test factual recall. Instead, instructors should employ strategies such as asking students to apply the concepts learned to solve some real-world problems. The activities should also have varying levels of difficulty so that students can choose an activity that matches their personal ability, while simultaneously providing them with an opportunity to accomplish more difficult tasks in order to master a particular topic or skill.

Other themes that participants perceived as engaging included interaction and support, and video lectures. As reported by participants, interaction and support from the tutors (instructors and/or teaching assistants) helped foster cognitive engagement, which can assist student learning of the topic. Not all the 18 MOOCs have the same degree of interaction and support. MOOCs that had relatively more participant comments about interaction and support such as the Interactive Python Programming and American Poetry courses used one or more of the following strategies:

- a) Providing an opportunity for students to interact with peer raters regarding their submitted assignments. For example, the instructor of the American Poetry MOOC provided an opportunity for students to interact with peer reviewers (e.g., seek clarification) regarding their submitted assignments. Students in the Interactive Python Programming MOOC could discuss the quiz problems with other students with the only rule being that they could not post explicit answers in the forum (Warren, Rixner, Greiner, & Wong, 2014).

- b) Organizing live online sessions for instructor and fellow students to exchange answers and ideas. For example, observation of the American Poetry MOOC revealed that the teaching staff of the said MOOC offered live webcasts every week for students around the world to join the live discussions through the telephone, Facebook, and course forums.
- c) Hold weekly one-hour virtual office hours. For example, the teaching staff of the American Poetry MOOC organized one-hour virtual office hours every week in the discussion forum to answer student questions. The Python MOOC used a professional help desk service (<http://helpscout.net>) to manage student email inquiries. Specifically, this desk service routed student help requests to a course website called “Code Clinic” so that the teaching staff could respond to them (Warren et al., 2014). The professional help desk service provides several useful features such as collision detection to prevent duplicate replies, an auto reply to let students know their email request has been received, auto tracking of student requests, and customizable stock responses to common questions (Warren et al., 2014; <http://helpscout.net>). These features helped the instructors managed the students’ email inquiries (Warren et al., 2014).

A variety of video production styles were used in the 18 MOOCs. These video production styles may be categorized under one or a combination of the following labels (Guo, Kim, & Rubin, 2014, p. 44):

- a) Slides: PowerPoint slide presentation with voice-over.
- b) Code: video screencast of the instructor writing code in a text-editor.
- c) Khan-style: video of instructor drawing freehand on a digital tablet.
- d) Classroom: video captured from a live classroom lecture.
- e) Studio: instructor recorded in a studio with no audience.
- f) Office desk: close-up shots of instructor’s head filmed at an office desk.

Despite the different video production styles, the following three findings should be noted:

- a) First, students prefer short videos. Findings from a study that analyzed 6.9 million video watching sessions across four MOOCs revealed that the median video watching time was six minutes (Guo et al., 2014). This therefore suggests that instructors should segment videos into short chunks, shorter than six minutes (Guo et al., 2014).
- b) Second, to help minimize student mind wandering during video watching instructors should embed short-recall quiz into the video. For example, the instructors of the Interactive Python Programming and Science of the Solar System MOOCs interrupted the videos with in-video quizzes. Several psychological research studies (Szpunar, Khan, & Schacter, 2013; Szpunar, Jing, & Schacter, 2014) have found that participants who answered short-recall questions after each short video segment (interpolated tests), retained more information at the end of the lecture as compared to the participants who did not receive any recall questions, or the those who merely watched the questions-with-given-answers. Compared to participants in the control group who were not provided interpolated tests, mind wandering occurred less (half as much) for participants who answered the interpolated tests (Szpunar et al., 2013).

- c) Third, lecture videos that featured different instructors' faces (e.g., appearances of guest speakers) were perceived to be more engaging because it helped break the boredom of watching the same instructor throughout all the sessions.

## Conclusion

Despite the worldwide attention attributed to MOOCs, scholars still understand little about student engagement in these large open online courses. This study offers a new original contribution by analyzing the reflective comments posted by 5,884 students who participated in one or more of 18 highly rated MOOCs in order to identify the reasons why participants find a MOOC or certain parts of a MOOC engaging. These 18 highly rated MOOCs were chosen from a pool of 282 subject disciplinary areas, having successfully fulfilled the following selection criteria: free-of-charge, rated five-star, and with more than 50 reviews. In this section, we discuss several implications for distance education theory, research, and practice. We conclude by describing the limitations of the present study.

First, the theoretical contribution of this paper lies in its examination of the elements espoused by Engagement Theory, as well as extending our current perspective of Engagement Theory in the context of large-scale fully online courses such as MOOCs that have no requirement for face-to-face attendance. We found that the elements of Creating, and Donating in Engagement Theory (which refer to the application of ideas, and to the use of real-world contexts respectively) (Kearsley & Shneiderman, 1998) were two of the themes found in the MOOCs participants' reflective comments. Many participants of the 18 highly rated MOOCs reported that the use of moderately challenging assignments that require them to apply the concepts or principles learned, instead of merely asking them to recall factual information, helped students learn the subject material better. Participants also reported that the use of content and resources focusing on real-world examples or problems made the course material very relevant. This helped bring tangible meaning to the concepts or principles taught, which sustained students' interest, and enabled them to learn the material more easily because they could see how the principles or theories learned might be applied in real-life.

Contrary to expectation, the Engagement Theory element of Relating, which emphasizes peer interaction (Kearsley & Shneiderman, 1998), was one of the least mentioned themes found in the MOOCs participants' reflective comments. This implies that MOOC students do not seem to attach much importance with respect to the need for peer interaction in large-scale open online courses when compared to traditional online or face-to-face classes. It is likely that the anonymous nature of MOOCs, along with job or family responsibilities diminishes student expectations of course interaction with their peers.

The present findings suggested that MOOC student engagement is promoted when certain instructor attributes are present, namely the instructor's ability to show enthusiasm when talking about the subject material, and the instructor's ability to use humor. These instructor attributes, which formed the most frequently mentioned theme perceived as engaging by MOOC participants, extend our current perspective of Engagement Theory in the context of large-scale fully online courses, which rely primarily on an instructor presenting the subject materials through videos. Although the inclusion of an instructor's face can give a more personal and intimate feel to the video lecture (Kizilcec et al., 2014), how an instructor projects himself or herself (e.g., by showing interest in teaching the material) seems to play a more important role than merely putting a face in the video.

Second, this study contributes to distance education research by proposing and testing five scalable algorithmic models. This is the first work, to our knowledge, that mobilized a repertoire of analytical and technological resources in the fields of machine learning and text data mining to analyze a large dataset of MOOC students' reflective comments. Specifically, we found the Gradient Boosting Tree algorithm (Friedman, 2001), to be the best performing model. The detail technical procedure provided in this study will be of great interest to other researchers who are similarly keen in this type of research methodology.

Third, this study contributes to distance education practice by highlighting several practical solutions to other instructors of large open online courses, as well as those teaching traditional e-learning classes. For example, the various strategies to support instructor-student interactions, and practical tips of using video lectures (as described in the Discussion section) can offer possible solutions for traditional e-learning courses that might otherwise be overlooked.

We conclude the present article by highlighting three limitations. First, it should be noted that highly rated courses may not necessarily be the most effective ones. It is beyond the scope of this study to examine causal effect between course effectiveness (e.g., learning performance) and user ratings. Second, this study did not examine the participants' disaffection of using MOOCs. Exploring student disaffection may offer information that can complement our overall understanding of student engagement. We therefore invite other researchers to conduct this investigation. Third, *CourseTalk* did not provide any indication on which student comments came from students taking the MOOC for course credit or from students who were taking it for other reasons. This precludes an investigation of how the comments from these students may differ. Despite the aforementioned limitations, we believe that the findings of this study provide valuable insight on the specific elements that students find engaging in large-scale open online courses.

## Acknowledgment

This research was supported by a grant from the Research Grants Council of Hong Kong (Project reference no: 17651516).

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i <http://scikit-learn.org/stable/>

ii <https://spacy.io/>



July – 2018

## Differential OER Impacts of Formal and Informal ICTs: Employability of Female Migrant Workers



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### Abstract

Information and communication technologies aid marginalized groups in seeking social support, building proximate networks, and improving employment opportunities. However, one key factor that is understudied in the literature is the impact of open education resources (OER) on the employability of marginalized groups. This study focuses on open and distance learning in the context of low-income female migrant domestic workers as a marginalized community. Specifically, we assessed the differential effects of two types of communication: informal OER resources (e.g., social media, mobile calling, texting) and formal OER resources (e.g., classroom prescribed learning tools and lectures) on specific development outcomes of functional literacy and perceived employability. A survey was conducted amongst female migrant domestic workers (n=100) enrolled in the Indonesian Open University in Singapore. Results indicate that access to OER resources via computers in the formal context of institutional learning, when combined with employability awareness, had a significant influence on livelihood outcomes, i.e., perceived employability. However, this did not lead to actual improvements in learning – functional literacy. Instead, actual learning improvement was influenced by digital skills enabled by mobile phones and computers. The study concludes with a discussion on the policy implications for digital skills training via mobile devices for marginalized populations to bolster the positive effects of OER on livelihood outcomes.

*Keywords:* open and distance learning, open education resources, employability, literacy, migration

## Introduction

Open educational resources (OER) have been defined by the Organization for Economic Co-operation and Development (OECD; Orr, Rimini, & Van Damme, 2015) as “digital learning resources offered online ...freely and openly to teachers, educators, students, and independent learners in order to be used, shared, combined, adapted, and expanded in teaching, learning and research” (p.17). We argue (Bentley & Chib, 2016) that such a definition, focusing on the uses of the technology, ignores the societal impact of digital openness. Reilly and Smith (2013), in their book on *open development*, propose that information and communication technologies (ICTs) have the potential to facilitate improvements in the lives of people. In the context of marginalized groups, while ICTs have been shown to aid transnational blue-collar migrants in improving their employment opportunities via adaptation (Elias & Lemish, 2008) and formation of social networks (Law & Peng, 2006), one key factor that is under-studied in the literature is the impact of OER on employability.

OER are increasingly playing a role in distance learning systems in many parts of the world. Distance learning offers flexible learning opportunities, allowing minimization of constraints in terms of access, time and place, pace, and method of study (UNESCO, 2008). This means that distance learning, facilitated by the open educational resources available, offers enhanced access for groups customarily constrained from attending traditional institutions, such as secondary school graduates who fail to gain admission to university, women with domestic responsibilities, learners residing in remote rural areas, and impoverished or socially marginalized communities (Saint, 2003). The present study focuses on low-income female migrant domestic workers as a marginalized community, and examines their increased employment opportunities after attending open and distance learning (ODL) programmes enhanced by OER.

As a consequence of globalization, demographic shifts, conflicts, and income inequalities, transnational migrant workers have been increasingly departing their countries of origin in search of employment and security (International Labour Organization [ILO], n.d.). According to the United Nations Educational, Scientific, and Cultural Organization, women made up 48% of all international migrants worldwide (UNESCO, 2013), with over 17 million undertaking domestic work in Asia (International Labour Organization [ILO], 2013). In Singapore, where this study is situated, the number of migrant domestic workers totaled 239,700 (Ministry of Manpower, 2016), around half of whom were Indonesian (Thomas & Lim, 2011). Blue-collar migrant workers manifest stress from isolation and homesickness (Chib, Wilkin, & Mei Hua, 2013), often compounded by social discrimination (Aricat, Karnowski, & Chib, 2015; Qiu, 2009), stringent labor laws regarding employment mobility and labor rights (Humanitarian Organization for Migration Economics [HOME], 2015), and financial barriers to engaging in enrichment classes (Nguyen Chib, & Mahalingam, 2017). The relative isolation is often worse for female domestic workers employed in individual households, who have little private physical space (Hsia & Smales, 2010) or social freedoms (Thompson, 2009).

A stream of past research has specifically recognized female migrant workers' information and communication technologies skills to seek social support for alleviating stress in the destination country (Chib et al., 2013), building proximate networks to socially integrate into the destination country (Diminescu, 2008), and performing duties as transnational mothers (Chib, Malik, Aricat, & Kadir, 2014; Madianou & Miller, 2011). Past research has also elaborated migrant workers' ICT skills in the open education context, for instance in terms of self-initiated learning, in which foreign workers use mobile phone features to learn languages and access news (Chib & Aricat, 2016).

While studies on digital skills for social support and self-initiated learning have been well documented, few studies have explored migrant workers' use of OER for learning. Conversely, the OER literature has traditionally overlooked the advent of the most highly diffused communication tool of mobile telephony, with exceptions in the nascent field of mLearning (Park, 2011; Traxler, 2010). We aim to bridge the gap conceptually by examining the differential impact of digital skills (i.e., computer and mobile phone) at both personal (i.e., daily communication, entertainment) and institutional (i.e., distance learning at the Open University) levels. Specifically, we assessed the differential effects of two types of communication: informal OER resources (e.g., social media, mobile calling, texting) and formal OER resources (e.g., classroom prescribed learning tools and lectures) on specific development outcomes of functional literacy and perceived employability.

### **Formal Open Educational Resources in Distance Education**

The field of ODL has changed considerably since the 1960s when distance learning emerged, primarily due to the success of Britain's Open University model, and its many global counterparts (Perraton, 2012). Now, ODL goes hand-in-hand with flexible networked technologies, typically including technology-based interaction as a key element. We therefore adopt Keegan's (1996) view of open distance education, which combines the quasi-permanent separation of teacher and learner throughout the length of the learning process with provision of teaching materials and student support services that are enhanced by technology, such as print, audio, video, or digital resources. Two-way communication and occasional meetings are utilized for both didactic and socialisation purposes.

In a review of OER in developing countries, Bentley and Chib (2016) found that a majority of the studies claiming improved learning outcomes focused on the perspective of teachers, with little emphasis on pedagogical practices. Some scholars (de Hart, Chetty, & Archer, 2015) find significant institutional barriers to participation in OER initiatives in South Africa, while others find barriers to instructors' intention to adopt and use OER in Tanzania (Mtebe & Raisamo, 2014). A key missing ingredient, in studies that focus on the institutional perspective delivering digital content via computers in classrooms, is the ubiquitous availability of informal OER resources via mobile devices in students' lives.

There is a nascent literature (outside of mLearning) that focuses on mobile devices as sites for OER. For example, in terms of technological elements within open education, mobiles have emerged as significant learning tools for remote and marginalized students. Young and Hung (2014) find diverse use of OpenCourseWare within the Chinese diaspora from a variety of tablets and smartphones, yet do not provide evidence of learning outcomes. Traxler (2010) and Wagner (2005), on the other hand, have argued that mobile learning should not focus on techno-centric framings of learning and pedagogical practice. However, Ali and Samaka (2013) argue that there is reason to explore the significance of mobile technology to close the digital and educational access divide for marginalized students in open education. Students may be engaging in study for shorter periods of time on their mobiles, and will thus be better suited to learn in short bursts, or by dictating or recording videos instead of typing. However, many of these benefits have not been tested in formal education, and as Beckman (2010) remarks, lecturers may not receive adequate support to reconsider pedagogical designs. This institutional support may only come to fruition if it is shown that informal mobile learning is not only advantageous but necessary for successful student engagement in OER programmes.

### **Informal Digital Resources for Marginalized Populations**

For Indonesian migrant domestic workers in Singapore, the assumption is that ODL offers increased access and flexibility to gain access to higher education, while solving constraints related to limited time, income, and mobility. However, in reality, few of these programmes have provided specific evidence of impact, beyond learning skills, especially for marginalized students who may have distinct technological skills and habits due to their backgrounds and difficult working conditions. Prior investigations into OER in Indonesia offer technological proposals (Selviandro, Suryani, & Hasibuan, 2014) or evaluation of student perceptions (Harsasi, 2015), yet fail to suggest any improvement in their lives and livelihoods.

This paper explores the contributions of two perspectives on technological contributions to ODL: computer and mobile technological mediums, and formal and informal contexts of interaction in open distance learning programmes. Research has established a variety of complementary benefits of mobile use for migrant workers. These studies suggest that personal mobile phone use is likely critical for student engagement in open education programmes; yet this claim cannot yet be made strongly. Past studies have shown that mobile phone skills enabled informal and organic (i.e., self-initiated) learning on the part of migrant workers. Mobile phones enabled migrant workers and their families to learn about transnational livelihoods when they shared stories on what it was like to be a migrant worker in the destination countries (Cuban, 2014). For the latter objective, migrant workers used online dictionaries and English news over FM radio in mobile phones to help them learn English and improve knowledge on issues (Chib & Aricat, 2012). Mobile phones also facilitated semi-skilled workers to clarify technical doubts with their supervisors when on duty, thus making them self-learners and self-explorers at the same time (Chib & Aricat, 2012).

While past research has provided useful insights on ICT skills for personal use, this study fills a research gap by investigating migrant domestic workers' OER usage for livelihood outcomes. Studies have shown that ICT-based learning can reduce some aspects of social exclusion in terms of encouraging minority ethnic group learners to speak more within the host community (Webb, 2006). Noting the potential for migrant workers to use technology for learning (e.g., Kluzer, Ferrari, & Centeno, 2009), we investigate how migrant domestic workers use mobile technology to supplement formal learning at an open educational institution. We further investigate the differential impact of this learning process on specific outcomes such as functional literacy and employability.

### **Measuring Personal and Institutional Contributions to Development Outcomes Functional Literacy**

The first learning outcome that we investigate is functional literacy, which has numerous conceptualizations. This study adopts UNESCO's (1978) definition that describes it as literacy that is required for an effective functioning of one's group and community, and also for enabling a person to read, write, and calculate for one's self and the community's development. Functional literacy is thus emphasized to focus on the skills that can assist individuals to perform tasks essential for work and everyday living (Atkinson, 2014; Hayes & Valentine, 1989). Functional literacy can also strengthen individuals' capabilities to access health, educational, and economic services, which may contribute to their pursuit of development (UNESCO, 2008).

Functional literacy is an important construct, particularly in relation to migrant domestic workers, who constitute a low social class in Singapore due to their blue-collar occupations, limited wages, and migration status. Research suggests that functional literacy can help facilitate the social integration of marginal groups in society (Kagitcibasi, Goksen, & Gulgoz, 2005; Levine, 1994). Functional literacy is also seen from an empowerment perspective, particularly for women, in terms of self-esteem, economic

independence, and self-confidence (UNESCO, 2008). When women are able to exercise their literacy, the impact was even greater, as they were more likely to be able to support their children in practical ways, such as sending their children to school, thus contributing to literate societies in general (Carr-Hill, 2001).

ICTs can play an important role in the achievement of functional literacy. Several studies have examined the influence of digital resources on adult literacy skills. Eady, Herrington, and Jones (2010), for instance, developed computer applications that incorporated literacy skill-building opportunities, finding that the learners were proficient in the use of the application. Electronic dictionaries have supported learners to better understand content-specific vocabulary, which then improved literacy skills (Silver-Pacuilla, 2006). With this background, we propose that ICTs skills (mobile phone and computer) and OER access, both informally via mobile phones, and through formal institutional resources (for example, distance learning course at an Open University level) will lead to improved functional literacy amongst migrant domestic workers. Specifically, we put forward that:

H1a: The skill to use mobile phones by migrant domestic workers will positively influence their functional literacy.

H1b: Informal access to OER resources via mobile phone by migrant domestic workers will positively influence their functional literacy.

H2a: The skill to use computers by migrant domestic workers will positively influence their functional literacy.

H2b: Formal access to OER resources via computer at the institutional level by migrant domestic workers will positively influence their functional literacy.

## **Perceived Employability**

Employability in general refers to a process and factor that allows people to seek, maintain, and adapt to numerous employment opportunities (Fugate, Kinicki, & Ashforth, 2004; Garrido, Sullivan, & Gordon, 2012). The term employability has been used in various fields, including employment and public policy (Hillage & Pollard, 1998), education (Smith, McKnight, & Naylor, 2000), and economics (Brown, Hesketh, & Williams, 2003). The popularity of this concept has developed in part due to the shift in global business and policy from long-term tenure to short-term arrangements in formal employment (Berntson, Sverke, & Marklund, 2003). This implies that in a job market environment where there is a decrease in job security and a lack of long-term employment, individual assets are becoming very important (Rothwell & Arnold, 2007). Personal attributes such as skills, competence, and experience, may increase individuals' competitiveness. Even in situations when they remain in the same position in the labor market, their employability is likely to be enhanced.

This study examines employability as a person-centered construct, which means "adaptability that enables workers to identify and realize career opportunities" (Fugate, Kinicki, & Ashforth, 2004, p. 21) and "what people believe their employment options are" (Rothwell & Arnold, 2007, p. 24). This construct is important for the respondent group because positive effects on employment further contribute to economic wellbeing and quality of life. Additionally, gainful employment provides income and other benefits such as social security, health insurance, and legal protections (Gerards, De Grip, & Witlox, 2014).

Past studies have examined the relationship between ICTs and employability (Atasoy, 2013; Suhaida, Nurulhuda, & Yap, 2013). The diffusion of ICTs across all economic sectors has increased the demands in terms of workers' digital skills to adapt to the changing job market (Garrido, Sullivan, & Gordon, 2012), with digital skills increasingly crucial for people entering the labor market and those trying to seek a better job (Lindsay, 2005). Governments worldwide consider ICTs as means to enhance competitiveness by raising productivity and transforming business processes as well as contributing to employment, which eventually spur economic and social growth (World Bank, 2013).

Digital skills have increasingly been viewed as an important component of employability (Belt & Richardson, 2005). Computer skills, for instance, catalyze self-directed learning and widen access to social networks that eventually promote employability, especially for those in the job-search process (Lindsay, 2005). For disadvantaged and vulnerable groups who experience high levels of social anxiety and loneliness, telephone and internet access served as a means where they could find a safe and anonymous environment to build social relationships (Haddon, 2000; McKenna & Bargh, 2000). From a gender perspective, quite relevant to this study, the internet provides wide access to job market information, which increases the employability of women with ICT skills to participate in the labor market (Suhaida et al., 2013).

Despite the importance of digital skills to enhance employability, it is important to note that if most workers possess them, the value of the skills may diminish and hiring decisions may be based on other criteria (Garrido, Sullivan, & Gordon, 2012). For the purposes of this paper, factors such as education must be considered to develop one's skills (Brown, Murphy, & Nanny, 2003). As noted in the previous section on OER, an identified research gap was to examine the effects of open educational resources on livelihood outcomes. We propose that the ability to access open educational resources via mobile phones and computers will positively influence one's employability.

H3a: The skill to use mobile phones by migrant domestic workers will positively influence their employability.

H3b: Informal access to OER resources via mobile phone by migrant domestic workers will positively influence their employability.

H4a: The skill to use computers by migrant domestic workers will positively influence their employability.

H4b: Formal access to OER resources via computer at the institutional level by migrant domestic workers will positively influence their employability.

Past studies suggest that functional literacy, such as writing, reading, and math skills, are essential to function at work and everyday living, and hence has potentials to enhance individuals' employability (Atkinson, 2014; Hayes & Valentine, 1989). We hypothesize that:

H5: Functional literacy will positively influence employability.

An additional item on employability awareness (Gerards et al., 2014) was included to account for whether employment was a desirable outcome for the domestic workers. The full model is visualized in Figure 1.



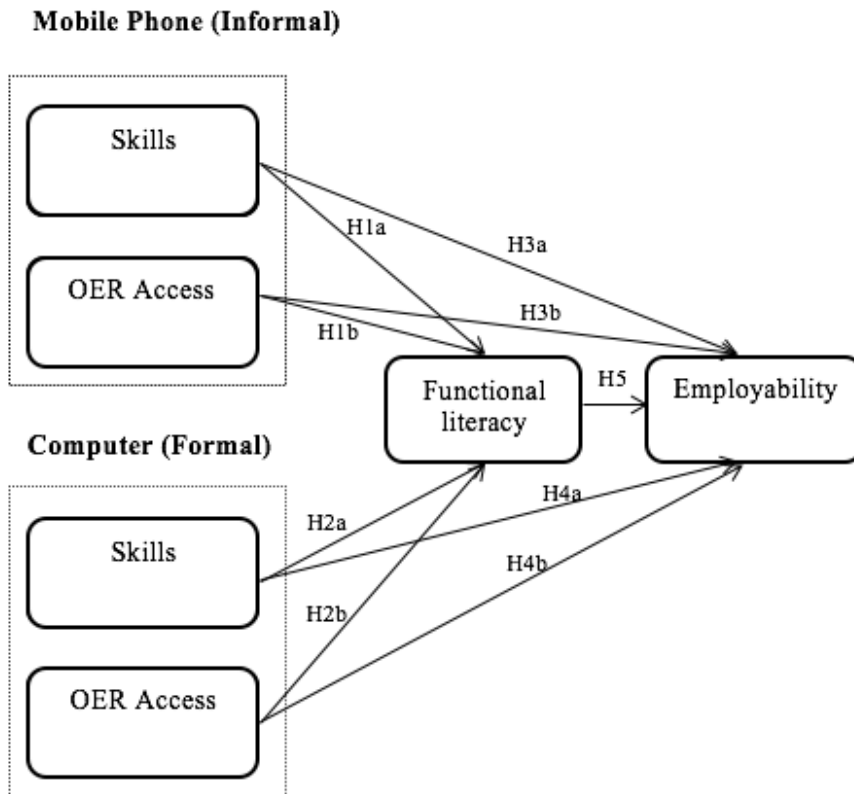


Figure 1. Conceptual framework.

## Method

### Participants and Procedures

We conducted a survey with 100 Indonesian domestic workers enrolled at the Open University (OU) in Singapore ranging in ages between 24-38. The participants were enrolled in different areas of studies at the OU, with accountancy and management the most popular choices in our sample. We examined female migrant domestic workers due to the following reasons. First, their employment and living circumstances are socially isolated; hence their access and use of ICTs provides for an interesting and significant research context. Second, these domestic workers were all women, thus the results may be used to inform policy decisions with regard to the impact of women's education and ICTs skill on employability and literacy.

We obtained ethical approval from Nanyang Technological University's Institutional Review Board. The respondents were selected based on their availability, meaning that those who were available during data collection period at the Open University were recruited to participate. The survey was administered in halls or classrooms. Prior to survey administration, we provided detailed instructions and consent forms to the participants. Participation was completely voluntary and participants were encouraged to ask questions as necessary. Each survey session lasted around 30 to 45 minutes. The participants were given incentives in the form of vouchers. In total, 110 survey questionnaires were distributed, and 100 valid questionnaires were collected, yielding a response rate of 91%.

### Measures

We translated the questionnaire from English to Bahasa Indonesia to respond to the needs of our Indonesian participants. We then translated the questionnaire back to English to ensure accuracy of the translation. The questionnaire included measures for mobile phone skill, access to OER via mobile phones, computer skill at personal level, access to OER via computers at institutional level, functional literacy, employability awareness and perceived employability. Confirmatory Factor Analyses (CFA) revealed that all the scales consisted of items that had factor loadings of .6 and above. Reliability analyses were conducted to achieve acceptable Alphas. Table 1 displays the descriptive statistics and reliability scores for variables on the 5-point Likert scales used, anchored from strongly disagree (1) to strongly agree (5), except as noted. The questionnaire also collected demographic information such as monthly income and programme selection of participants.

Table 1

*Descriptive Statistics for Key and Background Variables*

	<b>M</b>	<b>SD</b>	<b><math>\alpha</math></b>
Mobile phone skill	3.70	.81	.96
Access to OER via Mobile phones	3.33	1.15	.91
Computer skill	3.81	.64	.91
Access to OER via Computers	3.01	1.27	.93
Functional literacy	4.09	.55	.95
Employability awareness	4.23	.52	.61
Perceived employability	4.12	.57	.86

Note. M = Construct mean, SD = Standard deviation,  $\alpha$  = Cronbach's alpha.

*Mobile phone skills* were measured by asking participants to rate how well they use mobile phone for nine activities (e.g., texting, make/receive call, change wallpaper properties, change the phone settings, perform an internet search, access, and chat using instant messaging) on 5-point scales, anchored on no knowledge (1), beginner (2), good (3), intermediate (4), and expert (5). The items were modified from Madigan, Goodfellow, and Stone (2007).

*OER access via mobile phones* at the personal level was measured by asking participants to rate how often they used the mobile phone for eight activities of informal learning (e.g., make or receive call to discuss assignments or study materials with OU friends, access and/or download online materials from OU websites, access/search materials online, access OU Facebook Group to discuss assignments and study materials with OU friends) on 5-point scales, anchored on never (1), once a month (2), once a week (3), once a day, (4), and several times a day (5).

*Computer skills* were measured by asking participants to rate how confident they were in performing 10 activities (e.g., I feel confident using a computer/laptop, I feel confident making selections from an on-screen menu, I feel confident escaping or exiting from a program or software, I feel confident understanding terms/words relating to computer hardware (e.g., keyboard, monitor, disk drives). The items were adapted from Barbeite and Weiss (2004).

*OER access via computers* at the institutional level was measured by asking participants to rate how often they used computers for seven activities of formal learning (e.g., access and/or download online materials from OU websites, access/search materials online, access OU Facebook Group to discuss assignments

and study materials with OU friends) on 5-point scales, anchored on never (1), once a month (2), once a week (3), once a day (4), and several times a day (5).

*Functional literacy* was measured by asking participants 17 items pertaining to everyday reading and writing tasks (e.g., I know how to fill out an income tax form), math and measurement tasks (e.g., I know how to budget my money), and special literacy tasks (e.g., I know how to read and use road maps and city maps). The items were adapted from Hayes and Valentine (1989).

*Employability awareness* was measured by asking participants four items including “I myself am responsible for my future development,” and “I have a clear view of how I want to develop myself in the years to come.” The items were adapted from Gerards et al. (2014).

*Self-perceived employability* was measured by asking participants 10 items (e.g., the skills I have gained in OU are transferable to other occupations, I could easily retrain to make myself more employable elsewhere, I can use my professional networks and business contacts to develop my career, I have a good knowledge of opportunities for me outside of my current job even if they are quite different to what I do now). The items were adapted from Rothwell and Arnold (2007).

Analyses were run using hierarchical multiple regression in SPSS software. The participants’ age and income were entered in the first block as controls to ensure that these variables did not explain away the entire association between the independent and the outcome variables.

## Results

We first examined the zero-order correlations among variables to detect if there was any multicollinearity in the dataset (Table 2). No high correlations were noted, suggesting that there were no multicollinearity issues.

Table 2

### *Zero-Order Correlations Among the Variables*

Variable	1	2	3	4	5	6
1. OER Access via mobile phones	1					
2. OER Access via computers	.819**	1				
3. Mobile phone skills	.297**	.248*	1			
4. Computer skills	.314**	.363**	.403**	1		
5. Employability awareness	.092	-.021	.225*	.377**	1	
6. Functional literacy	.174	.158	.449**	.611**	.510**	1
7. Perceived employability	.281**	.266*	.312**	.486**	.350**	.442**

\* $p < .05$ , \*\* $p < .01$

H1 predicted that (a) the skill to use a mobile phone, and (b) access to OER via mobile phones at the personal level, would positively influence functional literacy, whereas H2 predicted that (a) the skill to use a computer, and (b) access to OER via computers at the institutional level, would positively influence functional literacy. As Table 3 shows, the block of demographics were not significantly related to functional literacy. The variables in step 2 added 38.6% of variance to the equation ( $R^2=.434$ ,

$F(6,56)=7.157, p<.001$ ) with age ( $\beta =.257, p < .05$ ), mobile phone skills ( $\beta = .357, p < .01$ ), and computer skills ( $\beta = .492, p < .001$ ), positively influencing functional literacy. In the final model, employability awareness added a significant 9.8% of variance ( $\beta = .343, p < .001$ ). Hence, H1a and H2a were supported whereas H1b and H2b were rejected.

Table 3

*Predictors of Functional Literacy*

Regression steps	<i>B</i>	<i>SE B</i>	$\beta$
<b>Step 1</b>			
Age	.006	.014	.057
Income	.212	.148	.193
$R^2$		.048	
<i>F</i>		1.511	
<i>df</i>		2.60	
<b>Step 2</b>			
Age	.026	.012	.257*
Income	-.163	.135	-.148
Access to OER via mobile phones	-.091	.080	-.174
Access to OER via computers	-.006	.074	-.012
Mobile phone skills	.252	.088	.357***
Computer skills	.449	.112	.492***
$\Delta R^2$		.386***	
<i>F</i>		7.157	
<i>df</i>		6.56	
<b>Step 3</b>			
Age	.026	.011	.257*
Income	-.171	.124	-.155
Access to OER via mobile phones	-.118	.074	-.225
Access to OER via computers	.047	.070	.099
Mobile phone skills	.231	.081	.329***
Computer skills	.337	.108	.369***
Employability Awareness	.416	.123	.343***
$\Delta R^2$		.098***	
<i>F</i>		8.931	
<i>df</i>		7.55	
Total $R^2$		.532	

Note. \*  $p < .05$ , \*\*  $p < .01$ , \*\*\*  $p < .001$ .

H3 predicted that (a) the skill to use a mobile phone, and (b) access to OER via mobile phones at the personal level, would positively influence perceived employability, whereas H4 predicted that (a) the skill to use a computer, and (b) access to OER via computers at the institutional level, would positively influence perceived employability. As Table 4 shows, the model in step 2 and 3 failed to reach statistical significance after controlling for differences in age and income. Hence, mobile phone and computer skills, access to OER via mobile phones or via computers at the institutional level, and functional literacy, were not significantly associated with perceived employability. However, in the final step, employability awareness added a significant 6.4% of variance in predicting perceived employability. A significant regression equation was found for step 4 ( $R^2=.265, F(8,51)=2.300, p < .05$ ) with access to OER resources via computers at the institutional level and employability awareness being positive predictors of perceived employability ( $\beta = .453, p < .05$  and  $\beta = .311, p < .05$  respectively). Hence, H3a, H3b, and H4a were rejected whereas H4b was supported.

Table 4

*Predictors of Perceived Employability*

Regression steps	<i>B</i>	<i>SE B</i>	$\beta$
<b>Step 1</b>			
Age	-.015	.012	-.177
Income	.057	.130	.061
$R^2$		.028	
<i>F</i>		.811	
<i>df</i>		2,57	
<b>Step 2</b>			
Age	-.003	.012	-.041
Income	-.054	.144	-.058
Access to OER via mobile phones	-.098	.083	-.223
Access to OER via computers	.144	.079	.349
Mobile phone skills	-.019	.099	-.031
Computer skills	.248	.151	.314
$\Delta R^2$		.178	
<i>F</i>		1.918	
<i>df</i>		6,53	
<b>Step 3</b>			
Age	-.009	.013	-.101
Income	-.011	.147	-.011
Access to OER via mobile phones	-.082	.084	-.187
Access to OER via computers	.145	.079	.352
Mobile phone skills	-.079	.110	-.132
Computer skills	.182	.135	.230
Functional literacy	.179	.146	.208
$\Delta R^2$		.023	
<i>F</i>		1.874	
<i>df</i>		7,52	
<b>Step 4</b>			
Age	-.004	.013	-.047
Income	-.054	.144	-.058
Access to OER via mobile phones	-.118	.083	-.268
Access to OER via computers	.186	.079	.453*
Mobile phone skills	-.044	.108	-.074
Computer skills	.154	.131	.194
Functional literacy	.026	.159	.031
Employability awareness	.320	.152	.311*
$\Delta R^2$		.064*	
<i>F</i>		2.300	
<i>df</i>		8,51	
Total $R^2$		.265	

Note. \*  $p < .05$ , \*\*  $p < .01$ , \*\*\*  $p < .001$ .

## Discussion

Our study examined the differential impact of digital skills (i.e., via mobile phones and computers) and access to open educational resources via both formal (computers at institutions such as Open University), and informal technologies (personal smartphones). Specifically, we assessed the differential effects of both types of communications on specific outcomes of functional literacy and perceived employability. Our findings revealed that access to OER resources via computers in the formal context of institutional learning had a significant influence on livelihood outcomes, i.e., perceived employability, when combined with employability awareness. However, this did not lead to actual improvements in learning—functional literacy. Instead, actual learning improvement as measured by functional literacy was influenced by personal attributes, such as mobile phone and computer skills.

These findings suggest that there are distinctions between institutionalized ICTs, such as computers available in classrooms for formal learning, versus organically diffused technologies such as mobile phones. We need to be nuanced in considering impact of OER for marginalized members of society who increasingly possess smartphones but can only experience computing in formal environments (Liebenberg, Chetty, & Prinsloo, 2012). There are certain implications from these results. Past literatures that have largely discussed specific functional outcomes of technology in the context of ODL interventions have focused on the deployment of computers only (Jonassen, Davidson, Collins, Campbell, & Haag, 1995; Olusola & Alaba, 2011).

However, the importance of mobile phones in advancing migrant domestic workers' actual skills advances past research which has shown that mobile phones have been largely used by migrant workers for personal purposes (Chib et al., 2014; Thomas & Lim, 2011). These personal uses seemed to have resulted in actual skills advancement, particularly in writing, reading, and counting, some of the most critical components embedded within the functional literacy concept. From a policy perspective, future guidelines in OER learning should go beyond computer-based learning in formal environments; mobile phone skills may provide benefits for migrant workers to support them in performing essential tasks in everyday living and eventually contribute to their pursuit of development.

It is interesting that access to OER resources did not significantly influence functional literacy. These findings appear to differ from those of Eady, Herrington, & Jones (2010) and Silver-Pacuilla (2006), who found the effectiveness of institutionalized ICTs in improving literacy. The differences in findings may be due to the assumption in OER packages that users possess a minimum set of digital skills, thus putting the onus of intelligibility and productive usage on the users, which may vary considerably in low-income marginalized populations.

Access to OER via institutionalized use of computers was found to lead to migrant domestic workers' confidence level to secure employment in the future whereas doing so via informal ICTs, such as mobile phones, did not. This is a major finding that directed learning via instructors in formal classroom environments, coupled with OER curriculum design, is likely essential to be translated into livelihood outcomes. It may not be sufficient to hope that minimally educated, low-income populations can achieve livelihood outcomes by self-directed learning. If it were so, then the ubiquitous spread of mobile phones would solve the educational barriers in developing countries.

It is further interesting that functional literacy did not significantly influence perception of outcomes, yet employment awareness did. This implies that our migrant domestic workers participants believed that mere literacy would not be able to lead to better economic opportunities without self-motivation. A more nuanced analysis would integrate the constrained societal circumstances of these foreign domestic

workers as an explanatory mechanism. With diminished labor mobility for blue-collar occupations, it is likely that the respondents valued the institutional credentials (e.g., diploma or certificate) obtained from the Open University over the personal achievement of functional literacy. We caution that structural factors of employment opportunities may have an important role to play in the perceived employability of marginalized sections of society, in addition to either their skillsets or agency.

Overall, our findings support the role of open educational resources in driving outcomes of perceived employability in the context of marginalized migrant females, earning meagre livelihoods as foreign domestic workers in the developed location of Singapore. However, we also note that these resources are not related to functional literacy, which is a function of users' own digital skills. The liberty for these migrant domestic workers to pursue higher education and non-discriminatory use of ICTs may contribute to a higher bargaining position for these women and to more equal opportunities between women and men in terms of skills advancement and employment opportunities. Benefits that they gain from education and ICTs are also hoped to have a far-reaching effect in that their perspective will further permeate in the way they choose to educate their children.

Conceptually, this study contributes to the body of knowledge in the area of open educational resources by broadening the assessment from ICTs at the institutional level to personal smartphones, and secondly emphasizing the impact of OER on specific livelihood outcomes. We provide new evidence of the differential effects of formal type of ICTs (i.e., computer) versus informal mobile phone usage in influencing functional literacy and perceived employability. Practically, higher education institution such as open universities may strengthen capacity of marginalized students in using, not only computers, but also mobile phones by organising programs that can support their skills advancement. Philosophically, we need to be aware of the structural disadvantages faced by marginalized communities in achieving employment objectives from institutional interventions.

Our study is limited by the cross-sectional nature, which did not allow the examination of ICTs usage on actual employment, or to claim causality. A longitudinal study where digital usages and skills are studied over a period of time would provide a more holistic assessment of causality. Another limitation pertains to the targeted sample of participants in the study which limits the replicability of the findings. The findings of this study do not represent migrant domestic workers in general because the OU students (i.e., participants in this study) were required to have a basic mastery of ICTs prior to enrolling, and we conducted this study in Singapore where ICT development and connectivity are high. We encourage future research investigating similar marginalized populations with varied digital skills in technology-rich contexts.

Understanding migrant domestic workers' ICTs skills in other environments warrants further investigation as the opportunities and barriers inter-context may be different. Future research might consider various factors from a structural perspective, combining two hitherto disparate concepts of technology-enabled learner support and the collaborative affordances of the technology (Thorpe, 2002) in situated contexts, incorporating structural issues of power imbalances and culture.

In conclusion, we note that "openness" is a conceptual construct that has significant potential for marginalized communities, such as female migrant domestic workers in our study. These range from benefits of perceived employability in institutionalized OER environments, and gains in functional literacy in self-directed digital learning from open access to communication technologies. However, open models are being applied, beyond distance learning (i.e., open-education), to other life domains such as

access, data, development, governance, knowledge, publication, science, source, etc., as a means to improve the lives of millions of the downtrodden (Benkler, 2013). The field of ODL has the opportunity to form conceptual inter-disciplinary bridges by contributing to the discussion around what exactly is “open,” be it the characteristics (Pomerantz & Peek, 2016), practices (Lane, 2009), and/or processes (Smith & Seward, 2017), particularly in evaluating the impact on the marginalized. We hope this article is a step in that direction.



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July – 2018

## Open Educational Resources: Challenges and Opportunities in Indian Primary Education



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### Abstract

Education is a fundamental human right, yet one fifth of the world's population lives with poor literacy. India is home to the largest number of illiterate people, with infrastructural, cultural, and socio-economic factors hindering equitable access to quality education. Due to the rapidly growing technology and Internet usage in the country, open educational resources (OER) are increasingly being used as a vital tool to help transcend barriers to child literacy, also aiding in educational attainment. While an array of scholarly works provides evidence of the potential in OER to influence higher education outcomes in developing nations, academic analysis of their impact on primary level education attainment has been minimal. This paper retrieve lessons from three children's content providing organizations to understand the opportunities and challenges of OER in primary-level education in developing nations with similar cultural, infrastructural, and socio-economic issues. While the findings of this study suggest that the use of OER allows for greater distribution and scale across different cultural and linguistic settings, particularly in rural and remote regions, they also warn against the adaptation and pedagogical barriers of OER into societies where traditional modes of education are established and trusted.

*Keywords:* open educational resources, literacy, language, access, equity, distribution, pedagogy, teacher training

## Introduction

Educational attainment is a persistent challenge for many countries with low levels of literacy (Paran & Williams, 2007). In the particular case of India, home to the oldest education system (Sharma & Sharma, 1996) and with one of the largest tertiary education systems (World Bank, 2007), it is also the country with the highest number of illiterate persons (UNESCO, 2014). Like most developing nations, poor school attendance and dropout rates are depriving Indian children from the acquisition of literacy (Mukherjee & Das, 2008), hence impacting progress and completion of primary education. This is common in countries with multicultural and multilingual communities (MacKenzie, 2009), which often lack sufficient pedagogic support for linguistic acquisition (Gelda, Narayan, Mudiya, Raturi, & Seshan 2013; Nambeesan, 1996). Access to resources and distribution channels are also a major problem for developing countries like India (Rai, 2014), requiring for a modification in policies and actions in order to pave way for equitable educational expansion (Govinda & Bandyopadhyay, 2010).

With the rapid growth of an information society, and the diffusion of information technology, new methods of learning have also increased, paving the way for alternate solutions for learning. A decade ago, a study led by the Organization for Economic Co-operation and Development (OECD) detailed this opportunity, identifying that new modes of learning and teaching also challenge established perceptions and practices of how education and the act of educating need to be organized and transmitted. The study had also emphasized that these new mediums could bring a change to the way learning happens, where most educational resources are protected by passwords and proprietary systems, restricting access to those outside the “paywall” (Organization for Economic Co-operation and Development [OECD], 2007). In the years that followed this study, the OER movement gained increasing recognition for its potential to overcome such barriers, and release this “contained” knowledge freely for the benefit of all, encouraging the equitable and widespread diffusion of resources. OER continue to receive increased global attention, especially due to their use by large institutions like the Massachusetts Institute of Technology (MIT), with multiple countries adopting them in their tertiary sectors (Van Acker, Vermeulen, Kreijns, Lutgerink, & Van Buuren, 2014; Stacey, 2010).

OERs are defined as materials available in the public domain for use in learning, teaching and research purposes. They are usually released under an open license, which allows free use or repurposing by the public (Tuomi, 2013), OER enable a multi-directional flow of knowledge (Conole, 2012). While openness in education has successfully established itself as a latest alternative option to acquiring knowledge (Weller, 2013), this success should be viewed as a water drop in the ocean of what openness entails (Scanlon, 2012). OER present certain challenges to educational practice at the literacy and primary education level, which providers need to address. They are not fully self-directed and therefore the requirement of tutors in online or classroom settings cannot be overlooked (Salter, 2011; Doğan & Eby, 2014). Another issue is that there currently are two divergent learning models attempting to co-exist: the OER model, which promotes independent learning, and the traditional education model, where the role of the institution is more explicit, as with MIT’s OpenCourseWare. (Knox, 2013).

Yet, the promise of OER’s potential in bridging the gap between formal and informal knowledge-transmission has been acknowledged and embraced by governments and independent organizations with the objective of widening participation in education (D’Antoni, 2009). However, while the



adoption of such non-traditional educational mediums into mainstream education poses challenges for both primary and tertiary sectors, much of the existing scholarly works have been on tertiary education. This has created a need for attention toward the different challenges for primary education (Geith & Vignare, 2008) that include, but are not limited to, the need for teacher training, which is the key enabler of OER utilization in classrooms (Whitworth, McIndoe, & Whitworth, 2011; Van Acker, Van Buuren, Kreijns, & Vermeulen, 2013).

This paper analyzes the experiences of three OER-providing case study organizations; the State Council of Educational Research and Training (SCERT), Pratham Books, and Siyavula, to explore the important role that OER can play in improving literacy rates and primary education attainment in multicultural and multilingual developing countries. In particular, this study engages with the innovative ways in which the case study organizations balance the need to sustain their business model and social mission, whilst acknowledging that OER will not be the standalone solution to revolutionize primary education in the developing world.

## Methodology

This paper is the outcome of a doctoral research, which undertook an in-depth multiple case analysis, as prescribed by eminent methodologist Stake (2005), of three children's content providers to understand the role and the ways in which OER could potentially impact primary education in developing countries. The study engaged with respondents from three prominent organizations: the State Council of Educational Research and Training (SCERT) (Tamil Nadu state, South India), Pratham Books (India), and Siyavula (South Africa), to gather state, national, and international level perspectives, respectively. The multiple case study design was used for this research, in order to identify, analyze, and synthesize the patterns, similarities, and differences across the three organizations' use of OER for literacy and primary level education. The motivation behind this choice was to probe the outcome of such a use, the methods employed, as well as to retrieve novel or divergent themes from the contrasting of the three cases.

At each organization, semi-structured interviews of staff involved in the creation and dissemination of OER were carried out. The individuals interviewed consisted of staff from different levels of hierarchy such as editors, social media managers, and chairpersons. The size of each organization and the availability of staff limited the total number of interviews to 11. However, the respondents that took part in the study largely helped in comprehending each organization's objectives, achievements, challenges, and development goals. As a result, saturation was achieved in each organization and it could be confirmed that every interview strengthened the prior understanding held about the organizations, without contradicting earlier ideas.

As part of the ethical clearance procedure, formal consent was obtained from the three organizations through formal letters and participant information and agreement forms. The interview questions were prepared to cover the respondents' views on OER, the opportunities, barriers, impact on literacy and primary education, intellectual property challenges, and funding, amongst others. Conducted at the convenience of the interviewees, mostly in their offices, the interviews generally lasted 1 to 2 hours. Naturalistic observation was also a part of the data collection phase, especially in the case of SCERT and Pratham Books, where subtle observation on work environment and behavior were taken

note of for a better interpretation of the results. Unlike SCERT and Pratham Books, wherein face-to-face interviews were conducted, naturalistic observation was not applicable to Siyavula since the interviews were held over Skype.

The inductive analysis method was utilized for data interpretation through the drawing of themes and concepts (Thomas, 2006). This method increased the robustness of results because it permitted each case study to be examined both independently and as a data source. The latter served in structuring and interpreting the meanings drawn from each data source (Thorne, 2000), allowing comparison between the case studies (Thomas, 2003). Inductive analysis also permitted a comparative analysis between the preconceptions and findings (Eisenhardt & Graebner, 2007; Yin, 1994), assisting in developing comprehensive knowledge about each organization and OER provision. More specifically, Creswell's (2012) six-step process was followed for the data analysis procedure. Following the collection, preparation and organization of data for analysis through the translation and transcription of audio recordings and notes, the data was thoroughly examined and coded to identify the themes. The three dominant themes that emerged were language, literacy, and culture; access, distribution, and pedagogy; and user-generation, quality, and sustainability. The first two themes form the main discussion of this paper, through the lens of the OER-providing three case study organizations.

## Findings

The results of this study cover some of the main themes that emerged, in relation to the opportunities and challenges for OER in Indian primary education: language and literacy; access, equity, and distribution; and pedagogy and teacher training. The findings reveal the complex interrelationships between these themes, which collectively determine the success of OER in this area.

### Language, Literacy, and OER

Language acts as a major barrier to literacy and thereby education, in countries where numerous cultures, faiths, and language groups coexist (Cobo, 2013; Torres, 2013). As a result, in multilingual nations like India, catering resources in all existing languages has thus far been a serious challenge.

We have 22 official languages in India but we have about 150 other languages spoken by people, in which very little publishing happens. And also within the 22 official languages, there are disparities. ...In a single language environment... you know, if you are in a western country and you speak only English, the amount of resources you'll get in English will be huge. Also if you see, the distribution of languages. ... Often, the smallest languages are spoken by the poorest communities so there is often no incentive to produce in that language. Why would a publisher go into a tribal language when nobody is buying the books there? (Singh, Pratham Books)

Linguistic diversity is therefore a significant barrier to the efforts in addressing the educational requirements (MacKenzie, 2009) of indigenous communities and minority language groups, given the complexities involved. Often, resource creators also have to bear in mind the different cultural combinations the language groups could present, affecting reception and use of the created content.

So, the difficulties come in many forms. The major one is the language. If you are writing about a boy who goes to school, which language are you going to write the story in? (Kumar, Pratham Books)

Here for example, in Kanyakumari [a Tamil Nadu district], there are Keralites [people belonging to the neighboring state of Kerala] and in Krishnagiri [a Tamil Nadu municipality], there are Kannadigas [people belonging to the neighboring state of Karnataka], so what do we do? In Chittoor [a district in Andhra Pradesh that borders Tamil Nadu], there are Telugu people. In Ranipet [a suburb of Vellore, Tamil Nadu], there are Urdu people. So, what would we do in such a situation? (Kuppusamy, SCERT)

OER providers like Pratham Books have found that OER have the potential to cater to multiple languages and cultural sensitivities at the same time (Nyaga & Anthonissen, 2012; Asfaha, Beckman, Kurvers, & Kroon, 2009). While their OER platform allows the creation and translation of content in numerous languages and scripts, they also provide bilingual and multilingual resources tailored to certain communities. The following extract explains the case of literacy resources created by Pratham Books for tribal children located in the Indian state of Odisha.

Both the texts are in Odia but one is in their local language, because it doesn't have a script and one is in Odia, so that way it helps. If they know what the story is in their own language, then they can understand what it is in Odia also. So we did this in four tribal languages (Hemant, Pratham Books)

For [a] community to develop mother tongue literacy, they need resources in their languages. We are now a text-based world. Unless every single person can negotiate text ... you won't be able to negotiate the new world. Therefore, having reading skills is critical... And really, this starts from mother tongue literacy. So, once you have mother tongue literacy, then you can learn other languages and subjects. (Singh, Pratham Books)

Based on the experiences and initiatives of the case study organizations of this research, which are largely invested in creating online multilingual resources and offline distribution strategies, it can be understood that OER stand a significant chance of impacting minority language groups in acquiring literacy through mother tongue education in rural and remote areas of a country like India.

I think the term that we are using very often now is in "online-offline" strategy. ... While creation happens online, consumption will happen offline, in most cases and we have structured strategies for that. (Shah, Pratham Books)

This "online-offline" creation and distribution strategy is especially crucial to developing nations where educational and technological infrastructure are inadequate (Kumar, 2009; Khanna & Basak, 2013) and access to resources (Bossu & Willems, 2012) by rural communities continues to depend on the distribution of printed materials. The forthcoming sub-section explores this in the context where access to technology may be unevenly available and where a focus on increasing or improving distribution channels may not be sufficient to challenge the existing inequitable outcomes.

## Access, Equity, Distribution, and OER

One of the key causes for pushing creation and consumption to take place on digital platforms is the prevailing distribution challenge that is at the epicenter of the need for greater and more equitable access to education and educational materials (Blackman, 2016). Open platforms, for instance, permit self-paced learning and vocational training facilities at the community level, furnishing socially required skills for underserved populations (Das, 2011). This creates an opportunity for OER to contribute towards the fulfillment of primary education goals, as described by the following interviewees.

You have so many children in so many schools without access to quality resources. ... I think [OERs] is a great way to kind of give kids who wouldn't have that opportunity otherwise to be able to read or view content, I think there a massive potential for that in India. (Raman, Pratham Books)

OER-providing organizations approached for this research demonstrated their commitment to open education through initiatives that go beyond the mere provision of online content. They utilize a range of strategies to address barriers to access, infrastructure, technology, and equitable distribution of education and educational content, which are specific to the context of literacy and primary education in developing nations, and hence, may not be applicable to developed nations or tertiary education.

I do think that people need to take the context into account. So, solutions [technology] built in America are just not going to work in the developing world. So, they could but they typically are designed for high-infrastructure, well-resourced environments. (Horner, Siyavula)

And, I think [OER] do have the potential but a lot of infrastructural [problems] need to be resolved. (Raman, Pratham Books)

The provision of a well-equipped learning environment with the latest educational technologies can have a transformative effect. Nevertheless, technology proves to be a disruptive innovation, in addition to the costs it brings. (Jain, Sharma, & Shelly, 2012). The case study organizations maintain a balance between online content provision, traditional print resources, as well as a number of other methods to produce content without or with little cost at the source. These resources are offered to end-users for free in flexible formats through download and print options, as well as through partnerships with community members, schools, and volunteers who act as the direct distributors.

One of the central reasons for the growing interest in OER use is their capacity to increase access to educational content across India, through the enabling of established new distribution channels, especially in the rural regions.

If [we wanted to distribute] beyond the metros and Tier-1 towns [cities with population above 100,000], there are no established distribution channels. ... So, distribution is a huge challenge. Over the years...we have simply gotten more innovative to find distribution solutions. (Singh, Pratham Books)

Almost 70% of the Indian population is concentrated in rural areas with poor connectivity. Conventional distribution channels are failing to reach children beyond the urban areas, requiring providers' innovative thinking in creating novel distribution pathways. (Baral, 2012). In such

circumstances, OER have been able to make a major impact even on the most remote and violence-inflicted areas, as exemplified by the below respondent.

Even, there was this person [volunteer] who was living in ... this place where there were a lot of Naxalites [Indian Communist (Maoist) guerrilla groups] and the parents actually send these children to something called a Porta Cabin, so their studies are not hindered by all the violence that is happening. ... He downloaded the book [OER] and then he projected it, and then he was reading to more than 100 children. ... Sometimes people enjoy doing it so much that they have now become storytellers, have their own initiatives [and] have libraries. (Hemant, Pratham Books)

The number of internet and mobile device users have been feverishly rising in developing nations like India, with large number of users on social networking platforms (Palackal et al., 2011; Singh & Gill, 2015), which could explain why users from such regions access open platforms to print resources for use. The potential of this shift is not lost in the case study organizations, which see themselves at the forefront of providing innovative, alternative, and cost-effective solutions for literacy and primary-level education achievements into the future.

It is primarily a resource thing, in terms of reach, we don't have the resources so online is our primary means. ... Essentially, it is very expensive. ... Even cost of production and royalties removed, the cost of printing and distributing is very high. So, essentially, what we are able to do as a small organization is to make these available online and then do advocacy around people who got the resources to print and distribute: governments, large funders, donors, etc. (Horner, Siyavula)

In all cases, these dissemination modes are run with a thorough understanding of the differences between target audiences and with the mandate of increasing access and equity in mind. However, while the effectiveness of OER may begin with distribution and access in achieving equitable education for the masses, it does not end there. OER and digital technologies are slowly penetrating school classrooms, requiring a paradigm shift in primary education from being teacher-centered and textbook-based to becoming learner-centered, which is a key component in determining the success of OER in such active learning spaces.

### **Pedagogy, Teacher Training, and OER**

OER are slowly penetrating classrooms in developed countries (Marcus-Quinn, 2016), as well as into developing countries' rural classrooms, as in the case of Sub-Saharan Africa, where teachers are using OER created by the Teacher Education in Sub-Saharan Africa (TESSA) Consortium (Murphy & Wolfenden, 2013). As noted by the respondents of this research, a similar trajectory has also been observed in classrooms across countries such as South Africa and India. Government bodies like SCERT as well as individual organizations like Siyavula and Pratham Books are working directly with teachers to encourage their understanding of OER and the adoption of OER into teaching.

I think it is really exciting when open educational resources start to impact teaching and learning practices ... [and] open educational practices. And specifically, so we have done a lot of collaborative authoring with teachers where we get teachers involved in the creation of open educational resources and that could be your foundational resource but then, the benefit and the potential of that resource can be adapted and built upon. (Beckett, Siyavula)

We have seen some teachers create flash cards as well, on the platform. So, that is another way of actually bringing different topics into the classroom and reading comprehension for sure. (Singh, Pratham Books)

The literature also supports the potential of OER in helping teachers develop practices and competencies required for efficient teaching, in parallel to which they are believed to support teachers in creating classrooms suitable to the needs of students (Misra, 2014). Most importantly, teachers can develop the necessary knowledge and skills to use OER effectively through training, in addition to which they can learn to produce their very own (Misra, 2012), allowing the fulfilment of student needs as well as providing teachers with the opportunity to become knowledge creators in their own right (Muegge, Mora, Hassin, & Pullin, 2008). However, teachers often lack technology knowledge and OER awareness, which are crucial for the adoption and success of OER.

And, I think a lot of them, especially, for more senior teachers, there is the fear of technology as well. “How do I use this?” and you know, “this is something I don’t know” and all of that is there. So, a lot of training and hand-holding there. (Raman, Pratham Books)

I think the teachers over here don’t necessarily know what OER is .... That is a term that we understand in use but for them it is “resources.” (Shah, Pratham Books)

For these reasons, the case study organizations largely engage in advocacy around OER and teacher training. SCERT for instance is dedicated to training teachers to use OER and classroom technologies for pedagogical improvements. However, it is revealed that there are a number of challenges in integrating OER into rural school systems.

There are problems in taking [OER] to the village-level. Taking this to the grassroots-level presents several problems. If you see, the students and the public schools will know of the availability of such resources only if the school headmasters repeat about the existence of such resources over and over again. ... So, a lot has to be done in this space. Till today, there continues to be a number of disadvantages. (Kuppusamy, SCERT)

On the OER side, it is complicated. I think we are at a formative sort of stage. Essentially OER represent something of a paradigm shift and we are still in the shifting stage. (Horner, Siyavula)

The case study organizations recognize that continued advocacy around such resources and justification for the use of new teaching methods are required to eradicate poor awareness and skepticism amidst school teachers, school management, and parents. “The movement toward greater openness represents a change of philosophy, ethos, and government as well as a set of interrelated and complex changes that transform markets, altering the modes of production and consumption” (Peters, 2012, p. 1041). The traditional teaching and learning method continues to be the most trusted and recognized method of education, because of which a change in such an established system could be time-consuming.

Traditional learning will always have some place or some part in how we learn and how our children learn. I don’t think, unless you go to a very very ... alternative, really really far left kind of leaning organization and you enroll your children there but for the kind of children we are talking about, I think there will always be an element of root learning, an element of

examination, in their lives. But I think you know the resources we give them to learn with, I think that can be revolutionary. (Raman, Pratham Books)

I think ... that [OER] can be truly transformative, both in traditional classrooms and in a digital environment. So, personally, I think they can have a massive impact in helping teachers do their jobs better, helping facilitating sharing, and then improving the quality of education for specific learners. (Horner, Siyavula)

The adoption of novel classroom technologies and learning mediums could impact student learning outcomes, breaking down traditional governance structures and teacher-centered education models (Kanwar, Kodhandaraman, & Umar, 2010). Moreover, in the absence of evidence to prove that the use of OER could have a negative influence on student performance, “the attitudinal response that OERs improve factors relating to student performance, such as enthusiasm, engagement and confidence represent a strong case for their adoption” (Weller et al., 2015, p. 359) by education providers such as schools and teachers.

## Conclusion

This study disclosed some of the most significant barriers to the full implementation and widespread use of OER in developing countries like India for the attainment of primary level education goals. The in-depth analysis of the three selected case studies of SCERT, Pratham Book, and Siyavula, in conjunction with the support of scholarly works in the area, revealed that language, illiteracy, poor accessibility, diversity, inequity, lack of sufficient distribution channels, lack of teacher training, and teacher-centered education are major contributing factors to the slowing down of OER adoption to address the basic education needs of the young population. Alongside the challenges, the results also showed optimism about the potential of OER in addressing the existing gaps.

In concurrence with the existing literature, this research found that the difficulties involved in teaching multilingual children could be overcome if digital technologies and OER could be absorbed into primary school classrooms (Thakrar, Zinn & Wolfenden, 2009; Wolfenden, Buckler, & Keraro, 2012) and if new educational policies endorsed mother tongue literacy (Nyaga & Anthonissen, 2012). Even though schools are starting to incorporate OER into teaching (Hennessy, Haßler & Hofmann, 2016; Marcus-Quinn, 2016), there are a number of oppositions and constraints that persist, mainly due to OER being viewed as contesting the traditional education system and textbook publishers (Kowalski, 2008; Bialecki, Jakubowski, & Wiśniewski, 2017). The case study organizations have demonstrated thorough understanding of the key needs of child literacy and primary level education in showing that the success of an OER-providing model relies on their continuous generation and involvement in initiatives such as capacity building and advocacy around the harnessing of OER, as well as the combination of both online and offline consumption strategies.

The increasing usage and generation of OER are not only useful to the citizens of the country of origin but are also being used in other countries around the world (Natarajan, 2011), as in the case of Pratham Books and Siyavula, whose resources have been largely utilized in neighboring nations. Although OER have the capacity to impact the underserved populations by breaking the barriers to distribution and access, scholars also warn against some pitfalls that can be caused by access-focused OER provision models. More precisely, they suggest in order to achieve educational equity, it is primordial to leave aside the distracting quantitative outlook and focus on qualitative aspects, such as

innovation and quality assurance, which future research should bear in mind. (Bossu & Willems, 2012). The present research provides an early guideline to how OER fit in the context of Indian primary education and the precautions for future OER providers to observe.

## **Acknowledgements**

The author is greatly indebted to Professor Belinda Carpenter, her former Ph.D. supervisor for making this research possible through the immense support and guidance provided, as well as to the Queensland University of Technology's (QUT) Law Faculty for their generosity in funding this work by providing the author with a Write-Up Scholarship (2017). This article is derived from a thesis submitted in partial fulfillment of the requirements for the degree of Doctor of Philosophy to QUT, Australia in August 2017.



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July – 2018

## Effects of Open Textbook Adoption on Teachers' Open Practices



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### Abstract

The purpose of this qualitative study was to understand whether certain theoretical benefits that open educational resources (OER) might have on teacher practice were being realized by a group of secondary teachers using open science textbooks. In surveys and interviews, teachers were asked to describe their classroom practice before and after adopting an open textbook, including practices relating to openness. Teachers were also asked to rate the quality of open textbooks they were using in contrast to textbooks used previously. Most participants reported changes to practice, and the most commonly cited changes could be attributed to a combination of openness and online format. For example, participants described linking textbook content to other online resources. In comparisons of current to previous practice, however, teachers did not report increases in the open practices of collaboration, revising, or adapting.

*Keywords:* textbooks, open education, educational practices, open pedagogies, open educational resources, OER

## Introduction

For K-12 teachers in the United States, finding textbooks that fully meet their needs can be challenging. Some textbooks are not adequately aligned to state standards, as publishers do not create separate versions for varying standards. Although *Common Core* standards are used in 42 states and four territories, textbooks labeled as “core aligned” may not actually be well-aligned; standards alignment may be tacked on afterwards and not integrated intentionally in the design (Common Core State Standards Initiative, 2016; Polikoff, 2015; Stern & Roseman, 2001). Some textbooks that do align with the standards may not be developmentally appropriate or adequate in differentiated instruction for individual student needs.

With commercial instructional materials not meeting teacher and student needs, some schools are turning to open educational resources (OER), defined by UNESCO (2016) as “any type of educational materials that are in the public domain or introduced with an open license” (para. 1). Many proponents of open textbooks note three potential benefits: (a) cost savings, (b) increased access to quality content, and (c) teacher empowerment or improved professionalism (Kimmons, 2016; U.S. Department of Education, 2015).

First, as OERs can be freely copied, used, and shared, they tend to cost less than commercial resources. Wiley, Hilton, Ellington, and Hall (2012) found that open textbooks could save schools 50% or more over commercial textbooks. With shrinking state budgets, lower cost is a compelling issue (Hilton III, Larsen, Wiley, & Fischer, 2016); however, using OER does not guarantee cost savings, as the previous study also showed that having teachers print small numbers of thick textbooks costs more than buying commercial books. Additionally, developing and supporting openly licensed resources is costly. Furthermore, reducing costs might not be a sufficient reason to replace commercial materials with OER. Administrators have reported that quality and features influenced their purchasing decisions much more than cost (K12 Handhelds, 2015).

Thus a second advantage, increased access to high-quality instructional materials, may be more important than lower expense. OER can be adapted—updated, improved, and tailored to the needs of schools and individuals—their use in schools with low budgets thus improves equity. However, not all OER are high quality, and identifying quality resources can be more difficult than trusting commercial textbook companies. Most secondary science classrooms use commercial textbooks, and selection processes vary among states, districts, and even within districts (K12 Handhelds, 2015). Prospective users must know enough about both commercial and open texts to efficiently judge their quality.

Third, OER use can empower teachers as they adapt resources to meet student needs. Kimmons (2016) has identified three main professional benefits of openness with OER: (a) supporting professional collaboration, (b) connecting teachers and students to a global community, and (c) allowing teachers to create content. However, administrators may discourage teachers from changing approved instructional materials; teachers may lack time, inclination, or knowledge to adapt resources; and teachers desiring to adapt OER need the support and trust of administrators. Thus current power structures and expectations

placed on teachers might not be amenable to teachers becoming active in curating, adopting, and adapting resources.

Likely due to its perceived benefits, use of OER in the United States is increasing. Since the U.S. Department of Education (2015) launched its #GoOpen campaign in October 2015, at least 91 districts and 19 states have committed to using openly licensed resources (Office of Educational Technology, n.d.). Through #GoOpen, districts commit to replacing at least one textbook with an open resource, and states commit to using OER, developing and maintaining an OER repository, and sharing resources with other #GoOpen states (Office of Educational Technology, n.d.).

At present, the potential benefits of K-12 OER use are mostly theoretical; currently very few studies have published data indicating whether potential benefits are being realized in K-12 settings. Most published OER research has focused on higher education, but separate K-12 studies are needed for the significantly different contexts. This study will contribute to the OER research base by examining the benefits realized by a group of secondary teachers using open science textbooks.

Three research questions guided this study:

1. How has using an open science textbook affected practices related to textbook use?
2. How and how extensively have teachers used the open practices of revision and collaboration?
3. How have teachers valued the open textbook used?

## Literature Review

The 2012 National Survey of Science and Mathematics Education reported that most science teachers used commercial textbooks, rated them positively, and supplemented them with other resources (Banilower et al., 2013). Early studies have indicated that K-12 teachers not using commercial textbooks can use open textbooks effectively (Wiley et al., 2012; Robinson, Fischer, Wiley, & Hilton, 2014; Hilton et al., 2016). Among the earliest published research on U.S. K-12 open textbook use, Wiley et al.'s (2012) study of 20 middle and high school science classes found no significant difference between standardized test scores of students using open or commercial textbooks. In a follow-up study, Robinson, Fischer, Wiley, and Hilton (2014) found that students using open textbooks in secondary science classes scored slightly higher than students using traditional textbooks. A new study comparing mathematics test results of elementary school students using OER and commercial resources found no significant difference (Hilton et al., 2016). In all three studies, outcomes for OER use, including cost and student test scores, were comparable to or better than outcomes for conventional materials.



In an international study of K-12 teachers' usage and perceptions of OER, most reported that OER helped them meet diverse needs, differentiate instruction, personalize instruction, provide broad coverage of curriculum, reflect on their teaching, and increase subject knowledge and that OER increased student independence, self-reliance, satisfaction, and engagement (de los Arcos, Farrow, Pitt, Weller, & McAndrew, 2016). In Kimmons' (2015) study of perceived textbook quality, 30 K-12 teachers evaluated open/adapted textbooks 38% higher than commercial textbooks (significantly higher on all 10 criteria), and 16% higher than open (non-adapted) textbooks.

Though in early phases, OER awareness, usage, and research are increasing, revealing varied benefits and challenges. In their 2013 evaluation of the state of the OER ecosystem, The Boston Consulting Group reported the movement has momentum, though still far from mainstream. Study participants (n=165) indicated their top two reasons for adoption were flexibility and low cost, and their greatest challenges were finding quality materials, especially for non-STEM subjects, and remixing and revising materials to make them useful. Additionally, Baker, Asino, Xiu, and Fulgencio (2017) found that digital divides and student preferences toward textbooks also play a role in how OER are used in K-12.

Given these challenges to implementing OER, sustainability is a significant issue. In a summary of K-12 adoption and implementation practices, K12 Handhelds (2015) concluded that districts purchasing K-12 instructional materials were more concerned with quality than price, and additional features, "such as customization, assessments, data gathering and analysis, and professional development," were "essential to adoption" (p.1). In survey responses, K-12 administrators showed ambivalence about open practice and the perceived benefits of open licensing. Butcher and Wilson-Strydom (2008) suggested that OER development and implementation should be successful if teachers choose to adopt open textbooks; are involved in the adoption; and are provided time, training, and compensation to produce high-quality textbooks. Wiley, Webb, Weston, and Tonks (2017) take this one step further and argue that long-term sustainability of OER may be best achieved by empowering students (rather than teachers) to become the creators and remixers of OER. Another way to increase sustainability may be to focus on theoretical benefits beyond cost.

While one of the major selling points of OER is its low cost to users, the cost of adopting open textbooks may vary significantly depending on the adoption model (Wiley et al., 2012). Kimmons (2016) has argued that stakeholders should focus less on cost and more on benefits such as collaboration, differentiation, and professionalization. Similarly, various researchers have called attention to flexibility, learner-centered education, collaboration, knowledge sharing, and ongoing quality improvement (Bliss & Patrick, 2013; Butcher & Wilson-Strydom, 2008; Tonks, Weston, Wiley, & Barbour, 2013). While these perceived benefits have been primarily theoretical, they seem a logical outgrowth of the ideals of openness associated with OER.

Remillard (2005) has characterized the teacher-curriculum relationship as "a participatory relationship between the teacher and the curriculum" (p. 236). In short, to be successful, teachers need alignment of curricula with their underlying teaching philosophies and support in learning new materials (Remillard,

2005, p. 239; Taylor et al., 2015). Based on these assertions, we might expect teachers who choose to adopt open textbooks to agree with a philosophy and classroom practice of openness, such as collaboration, knowledge sharing, and ongoing quality improvement. Drawing and building on previous research regarding the implications of openness (Kimmons, 2014), this study explored whether a group of teachers who were adapting and using open textbooks were experiencing these benefits.

## Method

In summer 2015, secondary science teachers from a pilot school district were brought together by the University of Idaho Doceo Center to adapt openly licensed science textbooks from CK-12, a non-profit foundation that provides free open online textbooks and other instructional resources (CK-12 Foundation, 2017). The following summer, 36 teachers from throughout a western state met for a five-day institute to update and adapt open science textbooks to use in their classrooms in the coming fall semester. The teachers met in small groups based on their courses of instruction and used textbooks provided through the CK-12 Foundation. After this institute, participants continued working with technical and resource support from the support center; 26 secondary science teachers participated in this study using openly licensed science textbooks that they had helped to create.

### Participants

Participants were teachers in Grades 7-12 who had adapted and adopted openly licensed textbooks in five subjects: biology, chemistry, earth science, life science, and physical science. Their teaching experience was varied: 38% with 0-5 years and 31% with more than 15 years. All junior high and high school grade levels were represented, and there was a fairly even distribution by grade. Most teachers reported that students accessed their textbooks online: 40% used online only, 44% used both print and online, and 16% used print only.

### Research Design

The current “basic qualitative study” was designed “to understand how people make sense of their lives and their experiences” (Merriam, 2009, p. 23). This seemed to be the most appropriate approach because our sample consisted of a relatively small group of practicing teachers and our desire was to understand (in their own words) how using the open science textbook had affected their practice. We collected data through surveys and interviews. We began with surveys to get a general sense across the teachers of how their practices had changed and to gather open responses on their experiences. Though we used a survey to collect initial data and to provide descriptive results of our sample, we analyzed the data in a qualitative manner (e.g., non-generalizable, non-inferential). We then did follow-up, semi-structured interviews with five teachers to dig deeper into issues that emerged from the survey. Data collection, including surveys and interviews, took place from January to April 2017 after most participants had used the resource for a full semester. Though results may be unique to teachers in a particular western state, we have provided

extensive detail in the teachers' own words to allow readers to determine the transferability of results to other contexts.

## Instruments

The survey designed for this study included varied questions about participants' classroom practice, textbook use, and perceptions. Questions about OER usage and classroom practice were modeled after the 2012 National Survey of Science and Mathematics Education (Banilower et al., 2013). For efficiency, most questions were based on a 5-point Likert scale. Items included two constructs of 15 items, each with Cronbach's alphas of .908 and .932 respectively, suggesting high internal reliability. A few additional questions solicited open-ended responses to allow detail, variety, and complexity in responses. At the end of the survey, participants were asked whether they would participate in a follow-up interview.

For these semi-structured interviews, we created a question bank aligned with the research questions guiding the study, modeled after examples of effective interview questions from Merriam (2009). Based on the participants' survey responses, the lead researcher compiled an individualized set of relevant questions for each interviewee and conducted a 10-30 minute interview via video conferencing.

## Data Analysis

We used descriptive statistics to identify general patterns in the data regarding teachers' ways of using open textbooks, changes in practice since implementing them, and perceptions of them. For open-ended questions, the lead researcher used content analysis to generate themes, sorted survey responses into categories, and selected five participants who were willing to be interviewed. We transcribed, coded, and classified interview responses, preserving interviewee confidentiality by assigning each a non-gendered pseudonym (Table 1). Initially we used line-by-line coding for critical data analysis; *in vivo* codes emerged from reading the data, to which we added focused codes to refine, synthesize, and make sense of the data (Charmaz, 2006). During analysis we looked for relationships between open textbook use and classroom practices.

Table 1

### *Interview Participant Demographics*

Pseudonym	Textbook	Grade level	Years of teaching
Alex	Biology	10	11-15
Bailey	Life science	7-8	11-15
Chris	Life science	7	6-10
Dana	Earth science	8	0-5

## Results

### Survey Results

Of 29 survey responses received, three were excluded because only background information had been provided (e.g., grade taught, number of years taught, textbook used). The survey included branching so that participants did not see all of the questions, and respondents were not required to answer every question; therefore, a number of responses varied slightly among survey items.

**Classroom practice.** Several survey questions related teachers' classroom practice to their current and previous textbooks (see Figure 1). Overall, respondents' practices were similar for both open and previous textbooks. Descriptive reports indicated they were slightly more likely to assign readings, questions, or activities from their open textbooks and less likely to skip sections of the open textbook, supplement the open textbook, revise or adapt the open textbook, or collaborate with colleagues or students to select or adapt instructional materials while using the open textbook (Figure 2). All reported changes were small (less than 0.5). The largest reported changes were decreased frequency of supplementing the textbook with outside readings or assignments and decreased revision or adaptation of textbook content.

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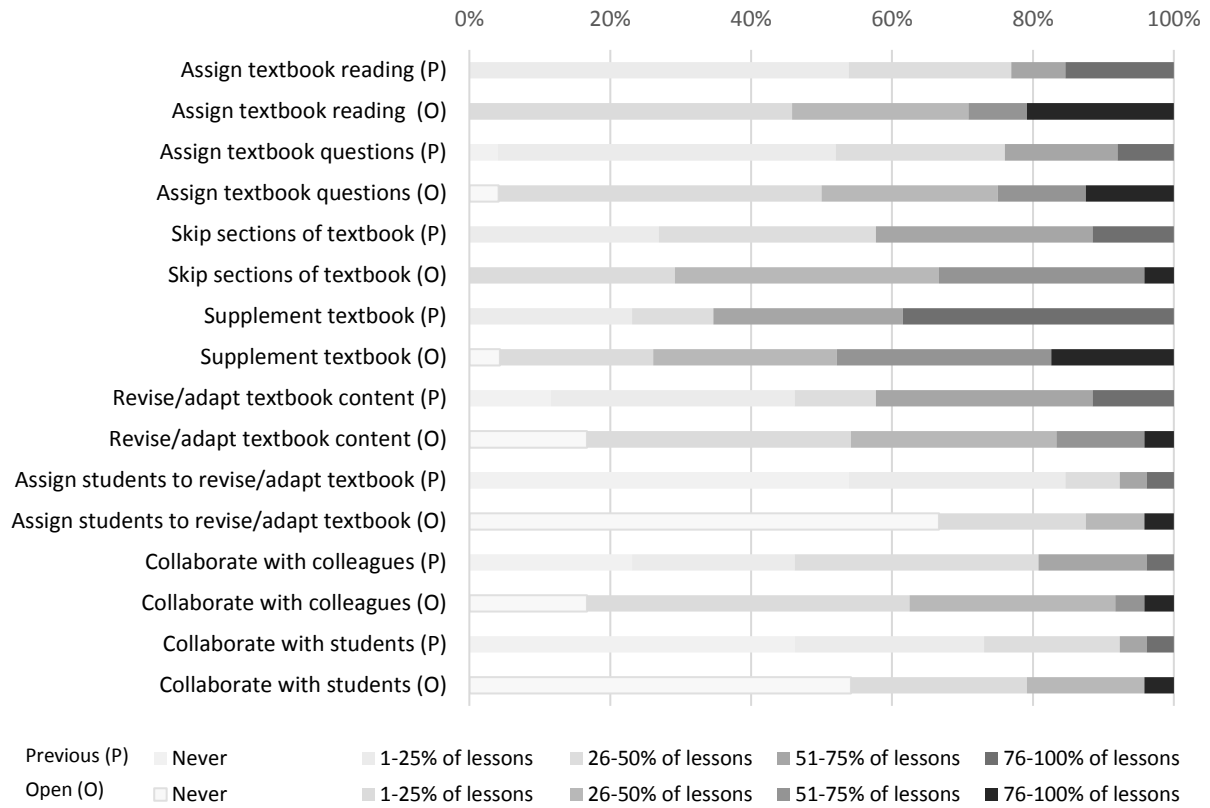


Figure 1. Frequency of certain classroom practices with the previous science textbook (top bar) and the current open textbook (bottom bar).

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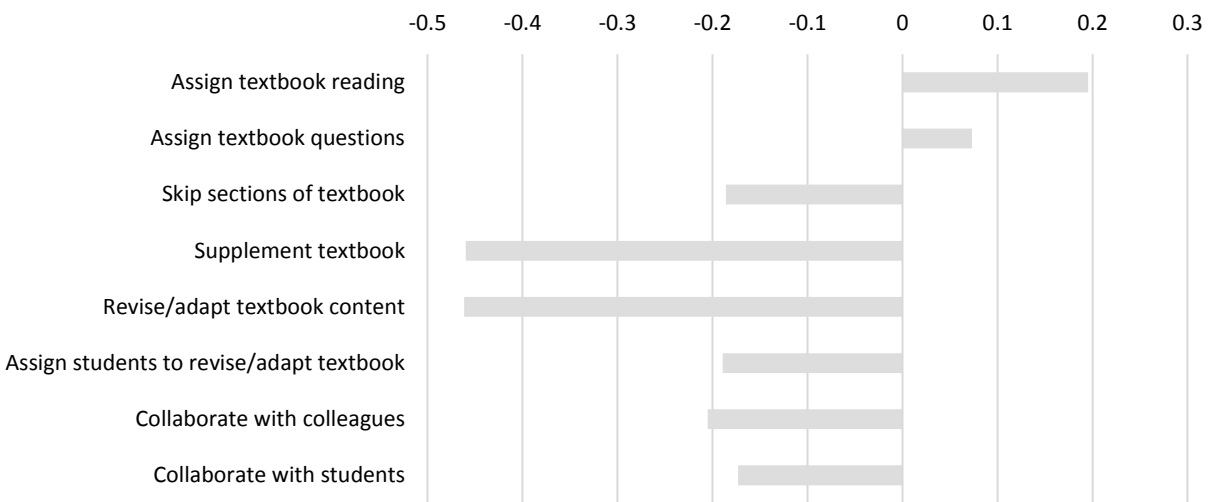


Figure 2. Comparison of frequency of certain classroom practices. Mean scores for previous textbook practice were subtracted from mean scores for open textbook practice. A positive comparison score indicates higher rates of the practice while using the open textbook; a negative score indicates higher rates of the practice with the previous textbook. The figure truncates the scale to show small differences in mean scores. The range of possible differences was -4 to 4.

For a separate question, almost all respondents reported making changes to classroom practice after adopting an open textbook. When asked the extent of their alterations, 4% chose *not at all*, 35% chose *minimally*, 39% chose *some*, 19% chose *considerably*, and 4% chose *almost entirely*. Those who reported at least some changes were asked two follow-up questions. First they were asked, “What have been the most significant changes in your classroom practice since you adopted an open textbook?” Of 13 total responses, two mentioned changes related to format: “Less printing” and “Using more online.” Three responses mentioned changes attributable to openness and quality: “I don’t need to skip around in the book and skip sections because the book is in the order I teach and includes the information my students need. There isn’t a bunch of extra stuff,” “More efficient coverage of required topics,” and “Assigned more reading.” Five responses mentioned changes that could relate to both format and openness: “Easier to use the best of all resources available,” “The use of technology which is built into the text . . . allows me to add videos and other resources,” “Flexibility and the allowance of independent student research,” “The ability to use other online resources in conjunction with the text,” and “I can incorporate materials I want [students] to have directly into the text.” Two responses mentioned changes pertaining to preparation and expectations: “Less time prepping” and “No need or push to use adopted purchased textbooks.” Two responses related to changes in outcomes, with format and openness as the most common contributing factors.

Respondents were also asked, “Which factors do you think most influenced you to change your classroom practices since adopting an open textbook?” The factors they ranked most influential were “involvement in the OER summer institute,” “textbook format (online),” and “other training (not related to OER).” The

factors ranked lowest were “school or district mandates,” “life events/personal factors,” and “textbook content.”

Participants reporting their changes as *minimal* or *not at all* were asked why they had made few changes. Of nine respondents, 67% chose “I didn’t need to,” 11% chose “I can’t think of any changes I would like to make,” and 22% chose “other”—specifying “I started the year off with a traditional text and need to work time into re-writing the curriculum” and “lack of tech to effectively implement.” Most respondents who made minimal or no changes indicated that changing to an open textbook did not require significant changes to their practice.

Most respondents reported that time for preparing to teach was about the same with the open textbook as with their previous textbook; none required more preparation time. Respondents who reported spending less preparation time noted, “I don’t have to find as many supplemental resources,” “I know this textbook better, but still have to find age app[ropriate] activities,” “I trust that the reading is up to date. Previous textbooks were printed in 1999,” and “It is easier to put material in each section (easy to find).”

**Perceptions of quality.** Overall, respondents rated both their open textbook and their most recent non-open textbook favorably but rated the open textbooks higher by a ratio of 3:1 (77% vs. 23%). Participants were asked to indicate their level of agreement with 15 separate statements about the quality of their current open textbook and their previous non-open textbook. Most respondents agreed with most of the statements for both (see Figures 3 and 4). They rated their non-open textbooks slightly higher on two measures: alignment to assessments and providing teacher support (see Figure 5). Regarding inclusion of differentiation strategies, mean scores were equal for open and non-open textbooks. For the other 12 measures participants rated their open science textbooks higher than their previous, non-open textbooks. The categories in which respondents indicated the largest differences in perceived quality were alignment to state standards and likelihood of recommending the book to other teachers.

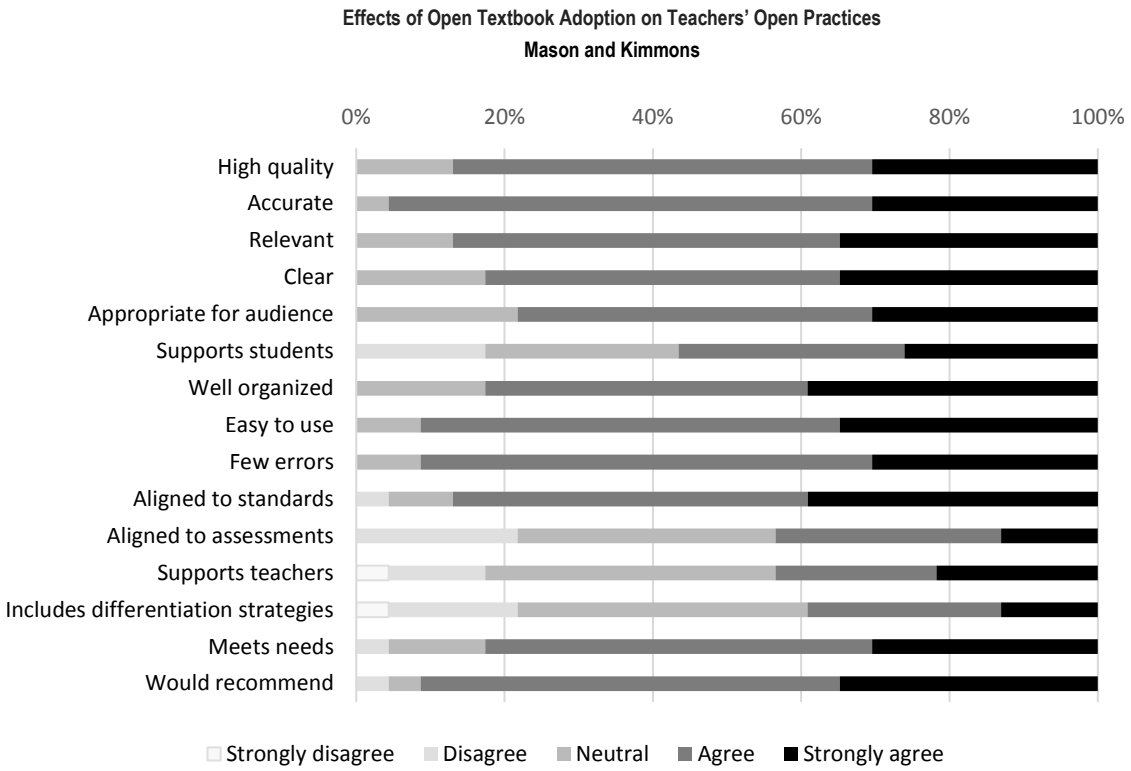


Figure 3. Perceived quality of open science textbooks.

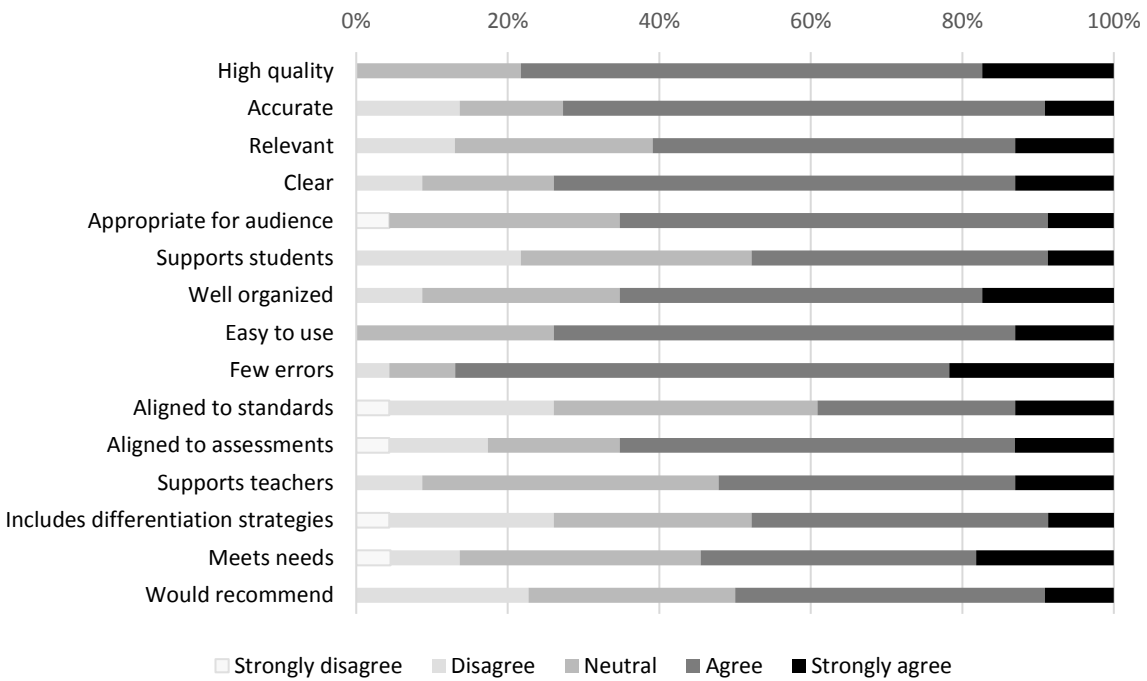
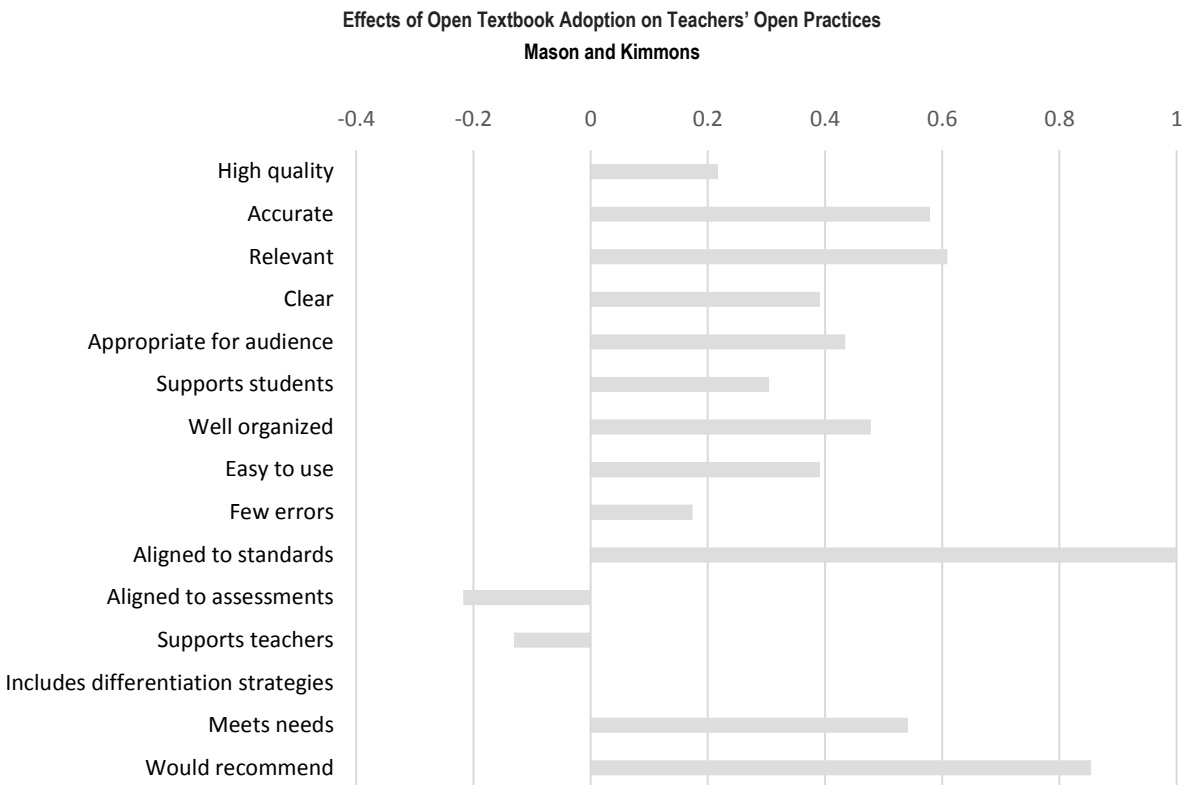


Figure 4. Perceived quality of non-open science textbooks.





*Figure 5.* Comparison of perceived quality of open and non-open science textbooks. Mean scores for previous textbooks were subtracted from mean scores for open textbooks. A positive comparison score indicated that teachers rated the open textbooks higher than non-open textbooks; a negative comparison score indicated that teachers rated their non-open textbooks higher. The figure scale was truncated to show small differences in mean scores. The range of possible differences was -4 to 4.

Most respondents who preferred their previous textbook indicated that it was of higher quality, while one noted a problem with accessing the open textbook. Those preferring the non-open textbook were more likely than the total sample (a) to have used print-only versions of the open textbooks and (b) to have reported only minimal changes to classroom practice; however, the number of participants who preferred the non-open textbook was too small (n=5) for a meaningful comparison.

## Interview Results

The five participants interviewed used three of the five textbooks and had varied teaching experience.

**Classroom practice.** Two of the three research questions relate to classroom practice. In interviews, the lead researcher asked participants to describe their transition from non-open to open textbooks, their experience with using open textbooks, and their changed classroom practices.

**Transition to open.** Interviewees described their shift to an open textbook as fairly smooth. Dana said, “Kids didn’t really get used to it for about a month, and then they got used to it, then it went fine.” Participants’ changes related primarily to the online format. Alex noted “a little bit of a change,” but

the district having adopted iPads the year before “made that transition a little bit smoother.” Similarly, Chris explained,

We’ve had iPads in the classroom for 4 years now. . . . So 4 years ago I switched to using . . . all kinds of apps and . . . online resources. . . . Now that I have a[n open] textbook . . . I haven’t changed my teaching—because I’ve been using open ed sources for 4 years.

**Textbook use.** About three-fourths of survey respondents said they used their textbooks in fewer than half of their lessons; teachers interviewed likewise described limited textbook use. When asked to mention a classroom practice that had not changed with open textbooks, Alex noted,

[M]y instruction doesn’t revolve around the textbook in any way, shape, or form. But I do think that it’s a resource, and a lot of kids don’t take advantage of it. . . . I still ask them to read, and now I can ask them to do some highlighting.

Eddie reported increased but still limited use: “I still don’t use [the open textbook] a ton . . . but I definitely use it more than . . . our old textbooks. And I plan to use it even more next year.”

Over several years of teaching, Chris had observed diminishing textbook use:

[I]t’s supplemental material. . . . I think when we had a paper textbook, [we] relied on that textbook and the supplemental material . . . to teach those things. And with open ed resources, I rely on my textbook this much [showed thumb and finger about an inch apart], and I use other resources as well.

**Changes in practice.** Multiple teachers noted changes in their ability to link textbook content to other resources, but perceived the significance of those changes differently. An interviewee who in the survey had reported only minimal changes to classroom practice commented that one of her main changes was being able to link assignments to questions and other resources. An interviewee who had reported considerable changes similarly reported that the most significant change was that she could incorporate additional materials directly into the text.

**Openness.** When asked whether changes in classroom practice had more to do with the online format of the textbook or its openness, Alex pointed out the interrelationship of the two:

I don’t think that you get one without the other. Well, I guess you could have the online stuff without the open. . . . [T]he fact that we can give them current information is huge. . . . When I put links into articles, it would be links to things that are current for right now.

Thus openness with the online format allowed teachers to adapt books to keep textbooks up-to-date and meet specific needs.

**Revising and adapting.** Participants recounted various approaches to revising and adapting open textbook material. When asked for an example, one teacher mentioned direct revisions to the textbook. Alex specified,

adding articles in, or adding different links in, rewording questions that may be misleading or unclear, changing just the general order . . . looking at the textbook and thinking about what makes sense . . . or updating information.

Eddie described making slideshows from the material, and Chris discussed making YouTube playlists “to use along with the book.”

While the flexibility to alter open textbooks was generally considered an advantage, those who felt no need to do so were grateful for open textbook completeness. Interviewee Dana reported having revised or adapted a previous textbook but not open textbook material. When asked why, Dana explained, “[I] don’t need to.” When asked about future plans for revising or adapting the open textbook, Dana replied, “Maybe. If I get time. I don’t have a lot of time.”

All participants had been involved in revising and adapting their open science textbooks prior to adoption. While some survey responses mentioned revising and adapting textbooks, interviewees reported that they would wait until the summer to make changes. Chris said, “We don’t mess with the textbook during the school year, even on an individual basis.” Eddie expressed the desire to adapt material, but lacked time:

I would like to customize it just a little bit more for the information for my class . . . [but] just didn’t have time. Because what we cover may vary a little bit [from] what is covered in the text, and I want to be able to get rid of some extraneous information and add some in.

Alex mentioned other practical reasons to wait until the end of the year to revise:

I don’t know how that works with what the kids have access to. And I know that we had a couple of technical issues when we were doing some editing and revising with it last summer because if it was shared at a certain point then those new edits didn’t really show up.

**Collaboration.** Openness can promote collaboration; most survey participants reported collaborating with colleagues to select, revise, or adapt instructional materials. Eddie’s example described significant, ongoing collaboration:

We meet once a week to talk about what we’re doing overall between our classes. And I work especially with one of the other science teachers. Our classes are similar, so we mirror each other quite a bit, so we’re always passing resources back and forth.

Collaboration requires time; Chris expressed appreciation for administrative support:

We are continually collaborating for uniformity for all seventh graders so that they get the same general materials throughout. . . . [O]ur district science department has been involved in lots of different grants over the last 4 years that have allowed us . . . collaborative time. . . . We've been so lucky.

When teachers have similar wants and needs, such collaborations tend to work well, but when teachers have conflicting opinions, the resulting textbook may reflect compromise rather than customized solutions to teacher's needs. Chris described both situations:

The first time it was just the teachers [from our district], and it was what we teach, and all the seventh grade teachers were there, and we designed the textbook based on our curriculum, based on our calendar, based on NGSS standards that we used, based on exactly what we did. . . . [The next year] a few of us . . . helped the other people from the state edit the book that we designed and edited to meet, supposedly, everybody's needs. . . . So we're using version two this year, and I think some of us . . . [feel], "No, we liked our book better." So we're going to go back and change it.

Dana, who helped produce an open science textbook for one subject but was using a different open textbook for a different science subject, regretted the difference: "The earth science book that we're using, it's not typically very streamlined, but I have access to a physical science book that's been very much streamlined." Open textbooks allow each teacher to customize, but most open textbooks represent collaborations—with compromises and some dissatisfaction.

**Perceptions of quality.** More than three-fourths of survey respondents preferred their open textbook to their previous non-open textbook. Four interviewees preferred the open textbook; one preferred the previous textbook.

**Advantages.** Interviewees affirmed open textbooks for flexibility, cost savings, accessibility, and independent learning.

*Flexibility.* When asked to describe the ideal science textbook, Eddie remarked,

I don't know if there is a perfect textbook because it would have to be different for every student. But the flexibility of this one is certainly appealing, and I like that it can be what I need it to be for different students.

Others agreed. Flexibility was the benefit mentioned most often: being able to revise and adapt the textbook.

Bailey expressed her preference:

[First] flexibility. Because . . . I don't feel compelled to do the chapters in order. I just feel like I can jump around as I please. I also really like the different types of online resources that we attached to our content.

Chris specified,

When you get a textbook . . . you get 50 chapters and you use three. . . . I like the fact that [this book] is designed by us, it excludes anything that we don't need. It is short and sweet; it only has what we need.

When asked whether she would opt for an online open textbook or an online commercial textbook if given a choice, Alex affirmed, "I would definitely choose the open textbook, just for the ability to make those adjustments."

An interviewee who had indicated a quality preference for her previous non-open textbook, commented that she "would not go back to a non-open textbook." She elaborated,

You can't keep current with a printed textbook. That's the bottom line. . . . And students now . . . the way they learn is different. So you can't go back to a textbook. . . . It's just too [un]changing, too static. [Students] just don't like it. . . . So I would never go back to a textbook.

*Cost.* Eddie began comments on advantages by saying, "It's a good resource; it's a free resource." Dana went further: "Our books are wearing out. . . . if I can use the budget that would normally go to textbooks for online stuff . . . [I would have] more for my spending budget." When asked whether classroom practice would change if the district switched to commercial digital textbooks, Chris noted their appeal:

Some part of me wants to say, "Oh gosh, it would be so easy to have [a commercial digital textbook]." . . . [Using open sources] still takes so much extra time and effort on my part that I could see where it would be . . . enticing to people. . . . (i)n our district, because of the way we are, and because of the amount of effort we put into using technology from the get-go, all of us think it would be a waste of money. I'm sure we all would!

While the lower cost of open resources can be compelling, open textbooks have associated costs, including time and training. Once districts have invested considerable time, effort, and money in open textbooks, they may never go back to commercial textbooks. However, the resources required to make the switch from commercial to open textbooks may keep districts from adopting or successfully implementing open textbooks.

*Access.* Interviewees included increased access among the advantages of online textbooks. Dana noted that students "have no excuse for not doing the homework [because] it's online." Bailey pointed out, "[S]o many kids leave; they're on vacation, and they need that easy access." Teachers mentioned access not only to the book but to other resources online. Dana specified, "There's access to links that the kids can click on. They really like that. And so it's easier—it's more time-effective than [the teacher] playing YouTube videos in class." Eddie praised the open textbook for using "a variety of images and videos in addition to the actual text."

*Independent learning.* Two interviewees anticipated that the open textbooks would promote student independence, but none reported observing this. Eddie made a specific application: “As a school we are moving toward mastery-learning, so students will be working at their own pace, and using the one-to-one will definitely be helpful with that.” Bailey shared a similar enthusiasm: “I’m excited to use this next year because I really want to stress this independent learning.”

**Disadvantages.** Most of the disadvantages of the open textbooks mentioned by interviewees related to online aspects of the textbook. Some, like Chris, noted ongoing problems with links: “The links don’t work all the time . . . maybe they work with Chromebooks, but they don’t work with iPads.” Eddie’s problem resolved itself: “Linking it at first was tough—I linked things wrong . . . . But now they hit the link just fine and it’s not a problem.” Another challenge mentioned was a lack of home internet access for some students:

I live in a school district in a town where not everybody has internet at home. . . . Now we have printed versions of [the open books], but [with] the printed versions, of course, you don’t get to use the links, so you don’t get to watch the videos. (Chris)

Alex’s only complaint dealt with careless use:

The only thing I’ve really had an issue with is that if someone doesn’t log out or log in, then somebody can . . . make edits, not necessarily edits to the book, but they can change my highlighting and they can change my notes.”

In addition to the challenges associated with technology, some requested more teacher support. Bailey emphasized the need for a teacher’s manual for each textbook: “Especially one that could even highlight the extra activities, and an answer key—things like that. I think that would be helpful.” Bailey also suggested an assessment bank, “Because sometimes writing your tests—it’s just nice to see those examples of how to assess your kids, and it doesn’t have to be formal” (Bailey). Survey results also indicated needs for teacher support.

## Discussion

This study examined outcomes of open textbook use, including effects on classroom practice. Most teachers surveyed reported some changes to classroom practice after adopting an open textbook, primarily related to the online textbook format with its capacity to make changes. Teachers for whom the format was the main difference might have found their classroom practice largely the same with an open or non-open online textbook. Others found their practice was affected primarily by the openness of the textbook: the ability to revise, adapt, remix, add links, and update the text from year-to-year. The effects of openness could not be entirely separated from format considerations.

## Open Textbooks

Three-fourths of participants preferred the open to previous non-open textbook, and respondents indicated in open-ended questions and interviews that the benefit they liked most was being able to revise and adapt it for their needs. As in previous studies (de los Arcos et al., 2016; Kimmons, 2015), participants rated open textbooks higher than non-open textbooks for various quality measures. Teachers who had been using insufficient numbers of outdated textbooks appreciated that open textbooks could be updated frequently and provided to each student at a low cost. Along with the strengths, participants suggested ways the open texts could be even more useful to them: (a) additional teacher support, (b) specific differentiation strategies, (c) improved alignment to assessments, and (d) better support for students above or below grade level.

The most common difficulties participants pointed out related to technology. Multiple participants reported problems with broken links—a minor irritation for some and a major hassle for others. Poor links and limited access can be remedied by providing students with print versions of open textbooks, an option that has delivered student outcomes comparable to or better than outcomes for students using traditional textbooks (Robinson et al., 2014). However, print versions need to be reprinted as they are updated, cannot be linked to content from other resources, and may cost more than electronic versions. As print versions of open textbooks do not provide all the benefits of online versions, study participants who reported using print-only versions of their open textbooks preferred the non-open textbooks that they previously used. Due to interactivity of openness and online format, the full benefits of open textbooks can be realized only where students have ready access to reliable internet service and electronic devices—a significant disadvantage to students in rural or low socio-economic communities. Also, open textbooks must be designed to work effectively on multiple platforms so that students with tablets have the same access to materials as students using Chromebooks, laptops, or desktop computers.

We had initially expected some teachers to make ongoing revisions of their textbooks throughout the school year, but interviewees indicated they saved revising and adapting for the summer months. They were too busy to make changes during the school year, and even simple revisions were complicated to share with students. Changing a version already published and shared might require students to download a new version of the textbook each time changes were made. Thus we recommend that administrators work with teachers to determine how frequently textbooks should be revised and to arrange time, training, and compensation for teachers to do so. The finding that teachers changed open textbooks only during the summer shows they were adapting the text to local, not individual student needs. Open online textbooks may facilitate differentiation with multiple ways of approaching material—linking to audio, video, and interactive resources—but survey and interview responses did not represent teachers providing customized versions of the textbook to individual students or small groups.

## Open Practices

We were particularly concerned with whether using open textbooks would increase classroom practices related to openness (e.g., revising and adapting the textbook and collaborating with colleagues or students;

cf. Kimmons, 2016). Conversely, our findings showed slight decreases in these areas. Survey respondents reported having revised or adapted their previous textbook in more lessons than they altered the open one, but these findings may involve a definitional issue: The open textbook can be directly revised and adapted, while the non-open one cannot. Thus revisions and adaptations to non-open textbook material were not likely textbook changes as facilitated by open textbooks. Furthermore, revisions made to open textbooks remained, whereas teachers were perpetually dealing with non-open textbook inadequacies. Though advocates might consider a decrease in the amount of revising and adapting as an adverse effect, teachers consider less revising and adapting as an advantage. Survey and interview responses indicated that the open textbook required less adaptation because it was better suited to teachers' needs.

Interview data indicated that strong collaboration during the process of revising and adapting an open textbook increased teacher satisfaction. But respondents reported decreased collaboration with colleagues and students after these procedures, a decrease unexplained by the data. The change was small enough to be attributed to a decrease in perceived need to use supplemental materials. Also earlier collaboration may have been for purposes other than selecting or adapting instructional materials. Though not reporting significant changes related to specific open practices, respondents did praise their open textbooks and value their openness.

### **Future Research**

Future studies that might build upon this work should further explore not simply whether OER influence open practices but specifically how OER might be leveraged to change practices. They also might explore differences between OER and how specific elements of different types of OER might empower pedagogical shifts over others (e.g., flexibility of a discrete learning object vs. comprehensiveness of a textbook). Throughout most of the literature, OER adoption or cost savings are treated as end goals, but ideally we believe that improved student learning and improved pedagogies should be a driving goal of OER research moving forward. So, future studies might ask questions like: (a) what elements of OER better influence changes in pedagogy, (b) how do teachers interact differently with OER in different formats, and (c) how can OER be used as a catalyst for rethinking and restructuring classroom practices as part of larger innovative initiatives?

### **Conclusion**

Three main findings were contributed by this study: (a) open practices of collaboration and revision did not increase after open textbooks were adopted, (b) participants preferred their open science textbook to their previous, non-open counterpart; and (c) the effects of online format were interactive with the effects of openness.

While one potential benefit of open textbooks is to increase open practices (e.g., collaboration, revision/adaptation of materials; Kimmons, 2016), in this study these open practices did not increase after



open textbooks were adopted. Teachers collaborated in initial revising and adapting of open textbooks, but having done so, they were generally happy with the textbooks and postponed further revisions for summer. Among this sample, the use of open textbooks may have alleviated the need for continual textbook adaptation, thus mitigating a theoretical openness benefit.

Three-fourths of teachers in this study preferred their open science textbook to their previous textbook. Participants' positive perception of the open textbooks seemed to correlate with their involvement in designing their open textbooks. Participants had designed their textbooks according to what they needed and wanted—accuracy, relevance, clarity, concision, and alignment with state standards—which translated into high perceptions of quality. These findings suggest that teachers may be more satisfied with a textbook they help design than with a textbook designed by others.

In this study, the effects of online format and openness could not be disengaged. The most commonly cited changes to open books, such as adding in or linking to other resources, could be attributed to a combination of openness and online format. The data suggested that open textbooks are most effective when they are online, with students and teachers having reliable home and school access to internet service and electronic devices.

This study was undertaken to go beyond theoretical discussions of perceived benefits to examine real practices and outcomes for teachers and students. Results showed that teachers were more concerned with practical than idealistic considerations. Teachers want textbooks that meet student needs, and while open textbooks may do so better than non-open textbooks, openness itself may not be high on teachers' and students' lists of needs.

## **Acknowledgements**

The authors would like to thank Cassidy Hall and the Doceo Center for Innovation + Learning at the University of Idaho for their participation in this project.

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July – 2018

## Adoption of Sharing and Reuse of Open Resources by Educators in Higher Education Institutions in the Netherlands: A Qualitative Research of Practices, Motives, and Conditions



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### Abstract

To find out what is needed to speed up the adoption of open sharing and reuse of learning materials and open online courses in publicly funded Dutch institutions of Higher Education, a qualitative research study was conducted in fall 2016. This study examined issues of willingness of educators and management, barriers and enablers of adoption, and the role of institutional and national policy in the adoption of open sharing and reuse of learning materials and online courses. Fifty-five stakeholders (educators, board members, and support staff) in 10 Dutch Higher Education Institutions were interviewed. The main findings of this study are: motivation for sharing and reuse of learning materials for educators and managers is directly related to the ambition to achieve better education for students; sharing and reuse of learning materials is common practice, very diverse and not open accessible for the whole world, and important barriers include lack of awareness of opportunities for open sharing and reuse and lack of time. Based on the findings from the interviews, the last section of this paper presents conclusions and recommendations regarding how Dutch institutions for Higher Education can formulate effective policies to raise awareness, organize adequate support and provide time to experiment.

*Keyword:* adoption of open resources, innovation, OER, Rogers' theory of innovation diffusion, Elias' notion of configuration, HE institution as innovation system, Dutch Higher Education

## Introduction

In June 2015 the Dutch Ministry of Education published its Strategic Agenda: *The value of knowledge. Strategic Agenda for Higher Education and Research 2015-2025* (Ministry of Education, Culture and Science, 2015). In this agenda, the following ambitions regarding open and online education in the Netherlands are presented:

- “I call on institutes and their teaching staff to share their educational resources and to use materials from their colleagues both inside and outside their institutes.”
- “I also, within this context, attach importance to the Dutch institutes’ recognition of each other’s MOOCs and ‘Open Educational Resources’.” (Ministry of Education, Culture and Science, 2015, p. 30).

Publicly funded Higher Education institutions in the Netherlands affected by these ambitions include 14 research based universities and 42 universities of applied sciences with a total of more than 700,000 students (2017<sup>i</sup>) and 120,000 employees (in FTE, 2016)<sup>ii</sup>.

Although the University of Delft was known for its use of OER in 2015 (van Valkenburg, Kos, & Ouwehand, 2015), the actual state of adoption of OER by Dutch institutions for Higher Education remained unclear. Simple questions such as “can you tell me what the state of affairs is on OER and MOOCs in university X or Y?” could not be answered due to lack of data. For institutions to be able to formulate effective policies, more insight was needed into the actual state of affairs.

Therefore, in fall 2015, a first national survey was undertaken to collect data about the use and/or production of Open Educational Resources (OER) and Massive Open Online Courses (MOOCs) in Dutch Higher Education (Schuwer & Janssen, 2016). The picture that emerged from this survey was that in 10 out of 15 research universities, 12 out of 23 universities of applied sciences, and in 4 out of 8 university medical centres, there was some form of producing and publishing of OER and MOOCs (Schuwer & Janssen, 2016). As to the reuse of OER and/or MOOCs, in 13 universities of applied sciences, 2 university medical centres and 9 research universities, OER and/or MOOCs were being reused (Schuwer & Janssen, 2016).

What also clearly emerged was that individual educators are the most important actors in creating, publishing and reusing open educational materials in Dutch institutions for Higher Education. They are also by far the most important catalyst in keeping materials up-to-date, guaranteeing the quality of the content, adding metadata to the learning materials, and in arranging and determining the rights and licenses to be used (Schuwer & Janssen, 2016).

However, why they do this, how they do this, and under what conditions has remained unclear. In the Netherlands neither overall studies nor in-depth case studies examining faculty members’ open and sharing practices at educational institutions were available in 2016.

In order to formulate effective policies to widen the adoption of sharing and reusing OER and open online courses at the institutional level, answers to these questions are needed. Factors and measures that influence the adoption of open learning materials in Dutch Higher Education must be analysed. This explorative study attempts to address the lack of research in this area by describing and

interpreting practices of sharing and reusing OER and open online courses by faculty and staff in Dutch public Higher Education institutions.

The research question for this study is:

What will lead to, or is needed for widening adoption of sharing of open educational resources and open online courses and of reuse of open educational resources and open online courses by educators in publicly funded institutions of Higher Education in the Netherlands?

In this article the approach taken and the findings of this research are presented. First we will present the methodology and research design. Then we will present the findings, followed by a discussion in which we will compare our findings with those of similar international research studies. Following this, we will formulate recommendations. In the last section, conclusions are presented.

## Method

In this study we have not just focused on OER as products or artefacts. Instead we have defined 'sharing and reusing OER and open online courses' as new practices, being an innovation of publicly funded Higher Education in the Netherlands. This is in line with definitions of innovation in education in OECD (2014) and Brennan et al. (2014). OECD (2014) has defined innovation as: "The implementation of a new significantly improved product (good or service) or process, a new marketing method, or a new organizational method in business practices, workplace or external relationships" (p. 22-23).

Brennan et al. (2014), in the context of research on innovation in Higher Education for the European Commission, describe innovation in education as "a new or significantly improved product, process, organizational method or an organization itself developed by or having a significant impact on the activities of a Higher Education institution and/or other Higher Education stakeholders" (p. 35).

An important characteristic of an innovation system is the central role for actors, as "the actors have a great deal to do with the policy outcomes" and "the innovation systems framework stresses the involvement of actors" (Iizuka, 2013, p. 4). This central role for actors causes the different outcomes of innovations in different organizations (Rogers, 2003).

For innovations in education, the most important actor, the decisive change agent in this innovation process of adoption of sharing and reusing OER and open online courses, is the educator (Mishra, 2017; Sloep & Jochems, 2007).

We have used the theoretical perspectives of Rogers (2002, 2003), Elias (1978) and Brennan et al. (2014) for the design of our qualitative research and for the interpretation of the findings. According to Rogers (2003), diffusion is the process in which innovation is communicated over time through certain channels among the members of a social system:

The innovation-decision process is essentially an information-seeking and information processing activity in which an individual is motivated to reduce uncertainty about the advantages and disadvantages of the innovation. The main questions that an individual typically asks about a new idea include: "what is the innovation?", "how does it work?", "why

does it work?”, “what are the innovation consequences?” and “what will its advantages and disadvantages be in my situation?” (p. 14).

Most individuals accept and adopt the new idea “not on the basis of scientific research by experts’ evidence but through the subjective evaluations of near peers who have already adopted the innovation (...). Their innovation behavior tends to be imitated by others in their system” (Rogers, 2003, p. 36). And about the process in (Rogers, 2002): “Diffusion is essentially a social process through which people talking to people to spread an innovation. The innovation-decision process is the mental process through which individual (or other decision-making unit) passes (1) from first knowledge of an innovation, (2) to forming an attitude towards the innovation, (3) to a decision to adopt or reject, (4) to implementation of the new idea, and to (5) confirmation of this decision” (p. 990). To target the bigger group and to achieve the stage of an early majority, institutional support is essential (Hall, 2005). Experiences gained with the adoption by the early adopters among educators can be used, because they are aware of and have experienced the innovative attributes of open online education to their teaching practices (Wilson & Stacey, 2004).

To describe the social process and the network of influencing peers in more detail, we follow Elias (1978). He suggests to begin investigations by analyzing neither the aggregate actions of isolated individuals nor societies as external structures, but rather the connections among individuals and society (Elias, 1978). For this, he introduced the notion of figuration, or configuration, which he “explicitly created to overcome the confusing polarization of sociological theory in theories that places the individual above society and those who place society above the individual” (Elias & Dunning, 1990, p. 148). As suggested by Elias, individual and society or structures do not exist separately. Structures are figurations, and can only be understood as being constituted by human beings (Elias, 1978). Through the notion of figuration, the behavior of individuals can be made understandable to themselves and in relation to one another, as “it is through interdependencies – or configurations – that individuals define the self and the world, they satisfy their needs, and their thoughts and actions” (Elias, 1978, p. 121).

Nevertheless, the individual educators’ adoption behavior is poorly understood when context is not taken into account. Educators’ behavior and their motivations are not only internal or subjective but are embedded within a social context (Giddens, 1984; Nardi, 1996). Educators’ practices with regard to OER and open online courses are always mediated and dynamically influenced by their configurations. Therefore, we have taken the view that adoption of sharing and reusing OER and open online courses at the level of the institution can be seen as the result of decisions of individual stakeholders. They experience accelerators and barriers and certain boundary conditions that have to be fulfilled to adopt the innovation. Acceptance of innovation on organizational levels and the environment may play an important role. Social influences such as: the extent to which colleagues and management have adopted the innovation; facilitation; support; stimulation; control structures; legislation; and regulations all may have an influence.

We have used the perspective from Brennan et al. (2014) to sketch out the typical configuration in which an educator operates. Brennan et al. describe a Higher Education innovation system as a set of functions, components and relations. Table 1 provides a description, derived from Brennan et al. and specified for this study.



Table 1

*Higher Education Innovation System*

Functions	Components	Relations
Education	Educators	Command / execution
Research	Researchers	Collaboration
Knowledge transfer, e.g. valorization	Institutional actors (board members / faculty managers)	Support / facilitation
	Support staff	Financial incentives
	Students	Non-financial incentives
	External actors	Networking

*Note.* Breakdown of a Higher Education innovation system, derived from Brennan et al. (2014).

We have combined the concept of configuration of Elias (1978) with the model of Brennan et al. (2014) to outline the system with its various types and levels of interactions in which an educator functions. Figure 1 shows the typical configuration of an educator in the Dutch public Higher Education system. We see this system as an open system in which educators are not only linked to other individuals in their institution but also to individuals external to their institution:

- Function: education
- Components: educators, board members, faculty managers, support staff. Some educators were also researchers, but they were interviewed in their role as educator.
- Relations: no exclusions. We have focused on the practices of educators in sharing and/or using OER and open online courses in their teaching activities, their relations with colleagues (internal and external to the institution), with support staff, management and with government.

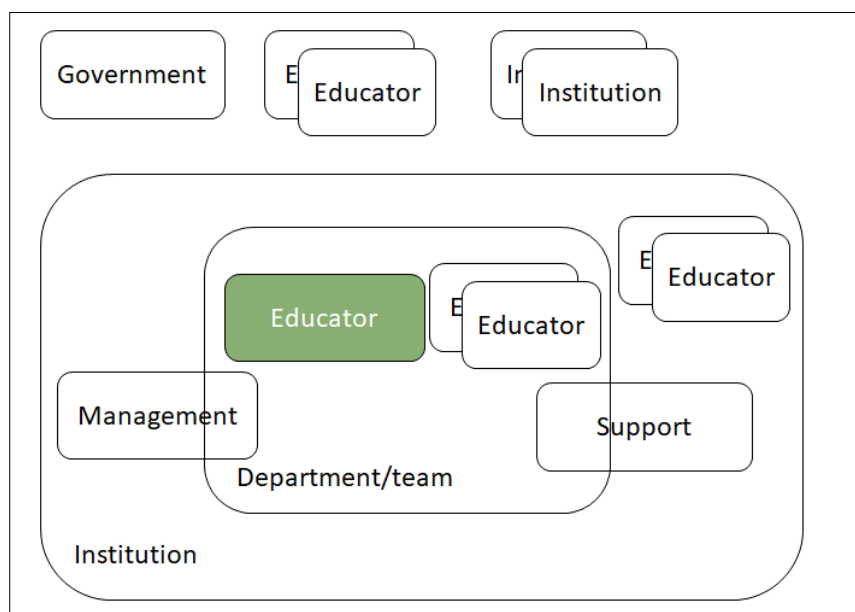


Figure 1. Configuration of an educator in the Dutch public Higher Education system.

For this study we have opted for a qualitative approach, in which we strive to understand the many forms of innovative adoption behavior of educators. This type of research is also called the interpretative variant of qualitative research, as it focuses on issues that relate to the way in which people give meaning to their social environment and how they behave on that basis (Boeije, 2008; Bryman, 2008).

Data collection took place by semi-structured in-depth interviews with educators, supportive and managerial staff from different departments and different institutions between July 2016 and December 2016. In total, 55 interviews were conducted, each lasting 30 to 60 minutes. Six interviews were in English and the others were in Dutch. Table 2 lists the topics addressed during the interviews.

Table 2

*Topics Addressed in Interviews*

Topic (code)	Description
Ambition	Goals to reach with education, both the results and the process.
Policy	Available policies on faculty or institutional level for open sharing and reuse.
Role open sharing and reuse	View on open sharing and reuse and its opportunities.
Motives	Motives for open sharing and reuse.
Behavior	Behavior (practices) in open sharing and reuse.
Accelerator	Factors stimulating open sharing and reuse.
Barrier	Factors hindering open sharing and reuse.
Support	Support needed and available for open sharing and reuse.
Boundary condition	Factors to be arranged to realize ambitions on open sharing and reuse.
Influence	Influences from stakeholders on open sharing and reuse.

*Note:* These topics were derived from the characteristics of an innovation system and the relations described in Table 1, as well as from the topics used in the questionnaires by the OER Research Hub (de los Arcos et al, 2015). These topics were also used as codes in the analysis of the interviews.

In the interviews there was no use of a pre-defined notion of "openness". Experience from our previous survey research (Schuwer & Janssen, 2016) and experiences derived from literature (Weller, 2014) have shown that the concept of "open" in sharing and reusing learning materials and courses can be interpreted in very different ways. For this research, the reference model in Figure 2 was constructed to describe characteristics of "open sharing and reuse."

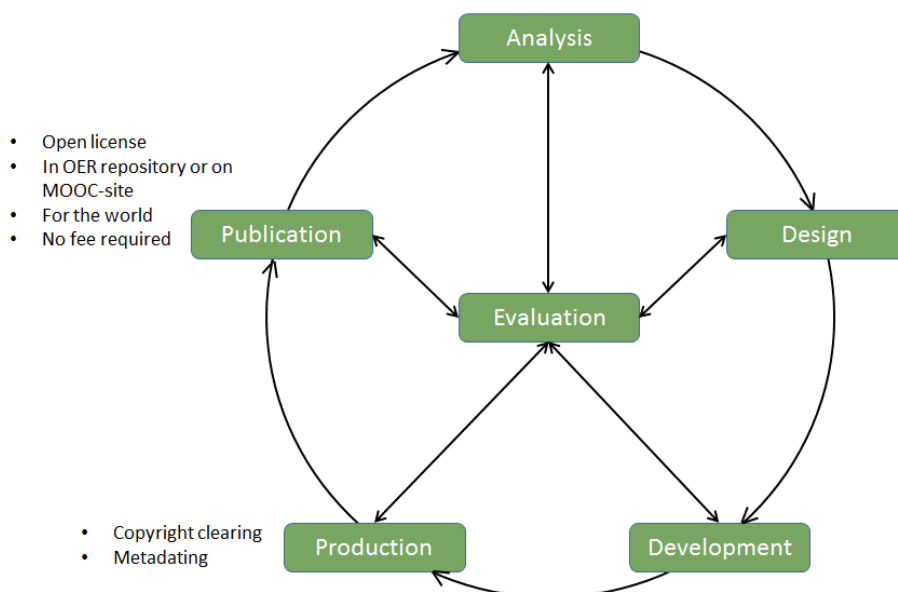


Figure 2. Model for the cycle of open sharing and reuse of learning materials and courses.

This model is an adaptation of the ADDIE Model for Instructional Design (Aldoobie, 2015). The creation, sharing and reuse of learning materials and courses (not necessarily open) is a cyclic process with successive steps of analysis, design, development, and implementation (production and publication). At every step, evaluation can be a reason to adapt the learning material, repeating the same cycle with the evaluation results as input. (Aldoobie, 2015).

When creating, sharing and reusing open educational resources and courses, the following assumptions are, in most cases implicitly, assumed by the open community, derived from the definition of OER (UNESCO / Commonwealth of Learning, 2012; Schuwer, Wilson, Van Valkenburg, & Lane, 2010):

- When producing learning materials, copyright clearing takes place and metadata are added to the materials to make them easier to retrieve.
- Publication of educational materials is done under an open license that permits reuse and modification under certain conditions, in a repository that is accessible to anyone interested in the world. There are no fees required for (re)use of the materials.

In the interviews for our research study, this model was neither shown, nor explained to the interviewees. Instead, interviewees were asked what they considered open sharing and reuse in their day-to-day practice. During the analysis of the interviews, the opinion of the interviewee on openness was used as a starting point.

The empirical work was situated in Higher Education institutions which have previously reported involvement with initiatives on open sharing and reuse of learning resources. The population for the interviews was determined according to the following criteria:

- Educators and faculty/institutions have experience with sharing and reuse of learning materials.
- Fields involved should be as broad as possible (social sciences, ICT and science, business).

In two research-based universities and two universities of applied sciences, interviews were conducted with board members, support staff, and per institution in two departments with educators and staff members. In four research-based universities and two universities of applied sciences individuals, educators and support staff were interviewed. Table 3 lists the distribution of the interviews within the different roles and types of institutions.

Table 3

*Distribution of Interviews*

Role of interviewee	Type of institution		Total
	Research university	University of Applied Sciences	
Management	5	6	11
Educator	17	15	32
Support staff	8	4	12
Total	30	25	55

All interviews were recorded, transcribed and coded using the Dedoose software (dedoose.com). The codes were based on the topics mentioned in Table 3 and were calibrated and finalized after the first five interviews. Two researchers coded the interviews. To measure the inter-rater agreement, a test generated by Dedoose, revealed a Cohen's kappa coefficient of 0.83.

Coding of the interviews resulted in 1936 statements. In Figure 3, the distribution of the statements among the codes and the interviewees is displayed.

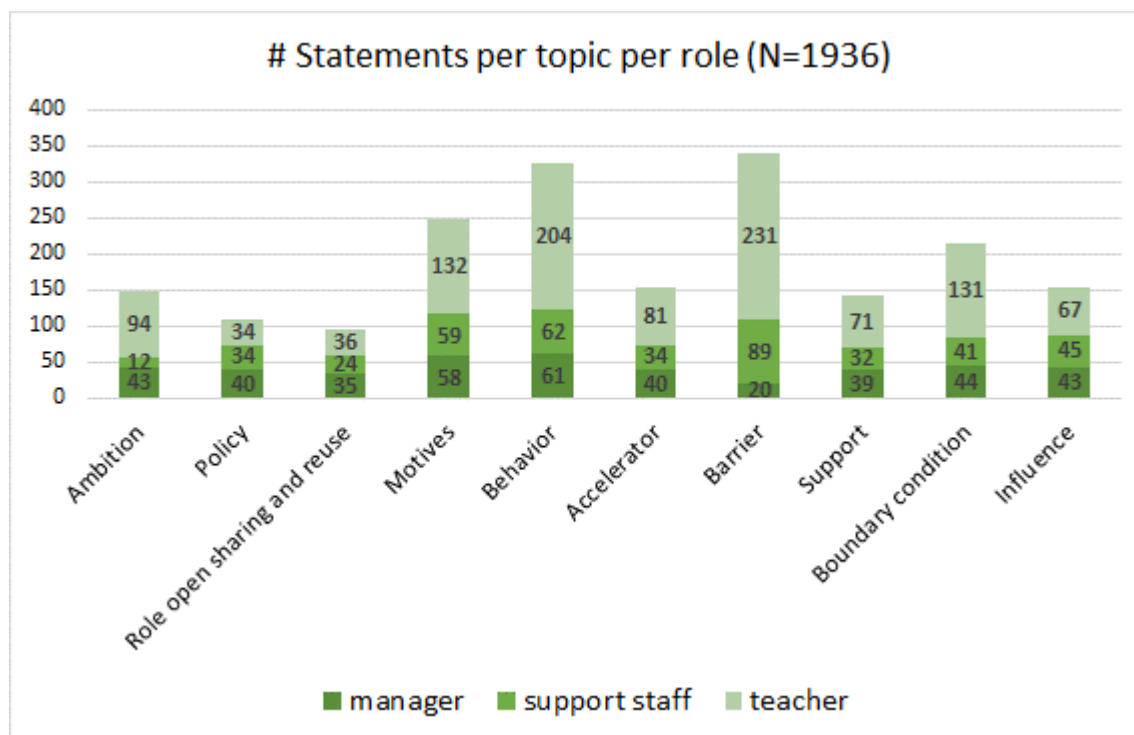


Figure 3. Distribution of statements.

## Ethical Issues

Every attempt has been made to protect the identity of the participants. No demographic, socio-cultural or institutional data are given which could lead to identification of participants. Before the interview, every participant was informed about the nature and purpose of their involvement, and that the interviews would be recorded and transcribed. Signed consent was obtained prior to interviews and permission was obtained to use the interview material for analysis and the report. Participants were given written assurance that information from interviews would only be used later, to ensure anonymity. Some of the participants in the study were members of the university community of which one of the authors is also a member. This probably did not affect the validity of the statements, because the interviewees were promised that their statements would be treated in a confidential and depersonalized way, and no other current issues than the ones in the questionnaire were discussed.

## Results

The findings are discussed under the following headings: Practices of Sharing and Reusing OER and Open Online Courses (behavior), Motivations, Policy, Barriers and Enablers. The boundary conditions mentioned by the interviewees were the barriers to be removed and the enablers to be enforced, and are thus included in “Barriers” and “Enablers.” Ambitions with education, the role of open sharing and reuse and influences are included in “motivations” and “policy.”

To illustrate the findings, we have added statements from the interviews. Statements originally in Dutch, were verbatim translated into English. To enhance readability, some statements have been slightly adapted, without loss of the meaning and intention of the statement.

## Practices of Sharing and Using OER and Open Online Courses

Educators reported frequent sharing and reuse of learning materials in their practice. Support staff and management reported observation of the sharing and reuse of learning materials. In terms of openness of these practices, however, a great variety of practices of sharing and reuse of learning materials has been observed. In most cases the interviewees called these practices open sharing and reuse. Referring to the model in Figure 2, however, shared and reused learning materials

- are not always shared in modes accessible for everyone, but instead are shared with colleagues (inside or outside their team, department or institution),
- are often lacking an open license,
- do not always undergo copyright clearing processes, and
- are in many cases not labeled with metadata to enhance findability.

As formulated by one of the educators: “It is not the case that we keep the learning materials secret. So, everyone who asks for them can get them. But we will not make it available everywhere.”

The reported technical platforms to share ranged from shared network drives and applications in The Cloud (such as Dropbox, YouTube and Slideshare), to institutional repositories, not always accessible for people outside of the institution. The previously named applications in The Cloud were also used for reuse of learning materials.

## Motivation

Motivations to share and reuse learning materials mentioned included:

- Institutional gains such as marketing and exposure, reaching new target groups (e.g. professionals in the working force).
- Financial (expensive resources).
- Educational gains including: ability to support blended learning (with flipped classroom as most mentioned form), efficiency in creating learning materials, handling diversity, improving quality of education, and improving quality of learning materials.
- Personal gains including: recognition, idealistic motives and counterbalancing commercial publishers.

An educator formulated efficiency gains as “Take the basics of mathematics for example, why should we develop materials on this matter ourselves?” Another educator compared sharing in education with what is customary in research: “Sharing is common practice in research, so why not also in education?” An idealistic motivated educator expected and experienced reciprocity in sharing: “I have created the resources and if I can help someone with them, why not. What I hope is that that person will also share his information with me. This happens a lot.” A manager saw opportunities in closer connections with the environment of the institution: “One of our core values is to openly share our knowledge. No barriers, and hoping that when we share openly, we are more capable to start research and educational projects together with business partners and the community.”

In some cases, management was not aware of sharing and reuse practices within the institution or department. Managers supposed that sharing has a positive effect on quality of learning materials, but were not familiar with facts or research to prove this.

Autonomy of an educator to determine whether or not being involved in sharing and reuse of learning materials is crucial and as such recognized and acknowledged by both management and educators. This means that forcing educators to go more open is considered unfruitful by management and could even be counterproductive. A manager formulated this as “I myself believe in that having a lot of autonomy one can achieve maximal. So I find it very important. Therefore, our management team, but also our colleagues, consider autonomy for teachers very important.”

## Policy

In a small number of the institutions visited, it was reported that policies on open sharing and reuse are developing, aimed at supporting educators by providing them time to develop and allow for appreciation and visibility of good practices. Institutions that do not have policies surrounding open sharing and reuse suggests that they may give priority to other urgent policy issues. For management of some of the institutions studied, openness was not a goal in itself, but a means to realize other strategic goals. Therefore, they explicitly connected adoption of openness with other educational innovations such as the introduction of blended learning or the renewal of the curriculum or with policy issues like achieving more internationalization. They assumed that this approach increases the chance of success of adoption of openness.

However, for institutions in which policies of openness were in place, educators were often insufficiently aware of them. When they were aware, they did not know the content of policies very well. As one educator formulated: “Something I miss, both on the level of educators and on the central level, is a clear strategy on why we do this, what we are aiming to accomplish and how we should act. All this seems to be absent. At the moment, a lot of effort is being put into realizing more openness. So it would be motivating to know what it is we strive for.”

Consequentially, many educators were uncertain about whether it was allowed or not to openly share their learning materials. Other educators, however, were not influenced by their lack of knowledge of institutional policy when practicing open sharing of their materials. In most cases the latter group was personally motivated for their sharing behavior. Educators in institutions with a clearly communicated institutional policy on openness were in general familiar with the policy, but they mentioned a lack of translation to what gains this institutional policy could bring to themselves when being involved with openness in education.

Notable is that most interviewees, both educators and management, did not mention some need of a policy for reuse of learning materials. When specifically asked, they indicated that the biggest opportunities for reuse are in introductory courses (efficiency) and in courses on subjects where the content is aging quickly (such as some topics in a computer science program). About reuse in introductory courses an educator said “Reuse has bigger advantages when you give a basic course, while for a course in the Master's phase or a more advanced course you modify the materials in line with the research associated.” A manager who was confronted with fast developments in its area experienced “Whatever materials staff has prepared, fact is that these materials have a life cycle of just one year. ...The speed of progress is so fast that we in fact discourage the development of materials by

our staff.” Reuse of MOOCs was explicitly mentioned several times to create a richer offering for students.

## Barriers

Next to uncertainty caused by lack of knowledge about policy, other barriers to sharing learning materials mentioned by educators included uncertainty about the value for them to share (“what’s in it for me” is not clear), uncertainty about quality and copyright violations, lack of time, lack of support and lack of awareness of opportunities for openness. As one educator said: “To reach the point where we will share our learning materials openly, I think it is important to provide insights in what the benefits are for us.” And another educator about the fear for copyright violations: “One has to be very careful, especially if one also stores materials. So to protect myself, if I use things of which I have doubts, I will not even try to use our own portal, because it could bring my institution into trouble.”

Also mentioned by some educators is the higher value attributed to research compared to education (especially researchers in a tenure track) and lack of a safe experimentation area (e.g. no immediate negative consequences when an error is made in using copyright protected resources). An educator said about different valuing of education and research “Being an excellent researcher and being less in teaching is accepted much more than vice versa.”

In the opinion of some managers, the fact that open sharing of learning materials is not common practice, as is the case with sharing of research results, was reported as an important barrier. Managers described this as an important cultural issue within their institution. Finally, absence of enablers as discussed hereunder was also formulated as a barrier by many of the interviewees.

## Enablers

For educators to become (more) involved in open sharing and reuse of learning materials, the absence or minor impact of the barriers mentioned previously was an enabler. Also, stimulation by internal grants, accompanying support and a central repository to find high quality learning materials influenced the volition of educators to share in a positive way. Support is needed for IT-related issues, educational issues (pedagogy) and copyright issues. Some educators mentioned receiving feedback on openly shared materials from peers or learners as a crucial factor for them to continue sharing. To enhance adoption of open sharing and reuse, management reported preferring organic growth, with small experiments to start and enlargement on the basis of success practices.

In institutions with experience with both publishing MOOCs and publishing OER, educators and some of the management preferred involvement with MOOCs more than involvement with OER. Especially the impact on reputation of the institution and themselves and a bigger audience providing a lot of feedback were mentioned as reasons for their preference. In these institutions, to get permission and support to publish a MOOC, its added value for campus education should be made clear. Management of these institutions consider publishing MOOCs as an accelerator for adoption of open sharing and reuse of learning materials.

Finally, both management and educators reported experiencing little influence from the policy actions from national government, nor from the ambitions mentioned in the government’s strategic agenda. The current national program of stimulation grants for experiments in open online education was considered to be insufficient for realizing the ambitions put forward by national government. Some



managers however, reported valuing the program of the government because it leads to debates about openness and provides financial means for experiments.

## Discussion

In the previous section, we presented our findings clustered in a number of categories. We then summarized the motivations of educators and management, the enablers and barriers, and the relevance of the context for the behavior of educators to share and reuse (open) learning materials. In this discussion, we will deduce conclusions from these findings and compare our conclusions with results from similar studies in order to come to recommendations.

The findings of the interviews are consistent with Rogers' (2003) view of a social innovation system as formulated earlier, which states that individuals evaluate an innovation using subjective evaluations of peers.

Our findings make clear that motivation for sharing and reuse for teachers and managers in the end, comes from their ambitions to achieve better education for students. This is in line with results of similar studies (Bliss, Jared Robinson, Hilton, & Wiley, 2013; Phalachandra & Abeywardena, 2016; Weller, de los Arcos, Farrow, Pitt, & McAndrew, 2015).

The motivations regarding institutional gains and personal gains are also found in similar studies by Jansen, Schuwer, Teixeira, and Aydin (2015) and Truyen et al. (2011). It is notable that savings for the students was not mentioned as a motivation, although counterbalancing commercial publishers could potentially be categorized as such. This is different from similar studies by Allen and Seaman (2016) and Bliss et al. (2013).

The practices of sharing and reusing learning materials and courses as described by interviewees are very diverse, but are not always as open as the OER-community propagates. Sharing while using an open license that allows adaptation and further dissemination under certain conditions, and publishing in such a way that the resources are available for free for anyone interested is recommended. We have seen practices of sharing, not meant for the world and not always under an open license. This finding was expected and is in line with what Weller (2014) has described, and is also consistent with findings of (de los Arcos, Cannell, & McIlwhan, 2016; Richter & Ehlers, 2010; Rolfe, 2017). One might say that most of the interviewees have a rather 'narrow' view of openness, and as a result on the one hand, opportunities of open sharing and reuse remain unused. On the other hand, these existing practices are a fruitful starting ground towards more openness (Czerniewicz, Deacon, Walji, & Glover, 2017; Mishra, 2017). By referring to their own practices, the opportunities of open sharing and reuse can be more easily demonstrated.

Many educators are not familiar with the added value of OER compared to the more closed types of sharing they practice. This last finding was also reported in Allen and Seaman (2016) and de los Arcos et al. (2016). Comparing the findings with the elements on openness in Rolfe (2017), the main elements addressed in our research were Content and Institution. Awareness about direct benefits in enhancing the practice of teaching, as Rolfe formulates, is not so profoundly found in our interviews. This may be explained because the interviewees of Rolfe were involved in an OER program, thereby probably more immersed in the world of OER than the interviewees in our study.

Almost every educator involved in sharing and reuse has indicated that he/she experiences barriers. Most mentioned barriers are lack of time and unfamiliarity with copyright. This is in line with barriers reported in (Allen & Seaman, 2016; Cox & Trotter, 2017; Jhangiani, Pitt, Hendricks, Key, & Lalonde, 2016). Some barriers that are reported (especially on reuse of OER) in the surveys by Allen and Seaman (2016), Jhangiani et al. (2016), and de los Arcos et al. (2015) were less frequently named in our research. This was especially the case with locating relevant and high quality OER. A possible explanation for this difference is that in our interviews, we have taken the interviewees' perspective on openness with regard to their actual practices of sharing and reuse as starting point. As previously indicated, in many cases this was a broader perspective than OER. So, the amount of potentially suitable learning materials is larger. Some interviewees from institutions with experience in publishing MOOCs consider this broader perspective of openness a boost for adopting open sharing and reuse of OER in their institution. This finding is also reported in (Czerniewicz et al., 2017).

Another difference with the surveys by Allen and Seaman (2016), Jhangiani et al. (2016), and de los Arcos et al. (2015) is that in these surveys educators have not indicated the higher value or award given to research compared to education as an important barrier. In fact, this issue has not been mentioned at all in these surveys. An explanation for this difference might be that in these surveys, questionnaires with closed questions have been used which did not include this particular issue. In the survey that contained an open-ended question on perceived barriers (Jhangiani et al., 2016), this issue was not mentioned by participants.

To promote wide adoption of open sharing and reuse, measures to reduce these barriers are needed. Availability of support on ICT, educational issues and copyright issues are mentioned the most by educators as a necessary precondition. This is in line with similar studies (Belikov & Bodily, 2016; Cox & Trotter, 2017).

In the interviews, the relative autonomy of the educator regarding open sharing and reuse is widely recognized by managers, support staff and educators. Measures to promote broad adoption of open resources should take this, as well as the motivation of educators to provide good education, as starting ground.

Although Dutch government has formulated ambitions on open sharing and reuse of learning materials and on MOOCs, in this study it was found that government's policy has not led to a broader adoption of OER. Most educators and some of the managers are unaware of the existence of the policy and its ambitions. Although in our study we focused on institutions with self-reported activities on open sharing and reuse, an institutional policy on this was lacking in some institutions.

Whether or not existent, not at all educators are aware of institutional policies and/or the specific content of these policies. This finding illustrates that "policy levers act far above the chalk face" (Haywood, Connelly, Henderikx, Weller, & Williams, 2014, p. 8) and that a cascade of policy actions are needed to reach the level of the educator. This is especially important, because many educators mention a clear policy on openness as a necessary boundary condition to take away uncertainties and secure necessary support and opportunities. This finding is also reported in Czerniewicz et al. (2017).

To better analyze, compare and explain barriers and enablers in a study on OER adoption at three South African universities, Cox and Trotter (2017) developed the concept of the OER Pyramid. In essence, this pyramid contains six layers. From the bottom to the top, these layers are: access to infrastructure (including electricity), permission to use or create OER, awareness of OER, capacity (skills and/or support available), availability of OER for use or sharing, and volition to adopt OER (Cox & Trotter, 2017). Underlying this pyramid is the view that volition to adopt OER is taking place when all the underlying layers are fulfilled (Cox & Trotter, 2017). For the Dutch Higher Education institutions, the barriers we found that prevent volition to adopt OER are mainly in the permission (educators are uncertain about it), awareness, and capacity layers. Access to infrastructure is no barrier at all, and the availability of OER for use and sharing was not mentioned. The latter resulted potentially from the fact that we used the opinions of the interviewees regarding what they called “open,” which creates a larger set of potentially useful learning materials than the strict set of OER.

Our goal was to interview educators, and related actors, who were involved in open sharing and reusing of learning materials already, who we consider the principal actors in this innovation. It proved that not all interviewees were early adopters, but all were related to early adopters in their configurations. For a broader diffusion of the innovation, the educators who have adopted the innovation already, and their subjective evaluations, are of crucial importance. In institutional policy these near-peers can be regarded as social role models (“champions”), whose innovation behavior, according to Rogers’ (2003) theory, hopefully will be imitated by others in their system.

Rogers (2003) has formulated generic recommendations to promote adoption of innovation. Applying these onto the findings from the interviews, the following recommendations at institutional level can be formulated.

### **Recommendation 1**

Make the innovative features of open sharing and reuse clear to educators. Examples of such innovative attributes mentioned in the interviews are: improving quality of learning materials through review activities by peers, enhanced opportunities to connect with the outside world in education, enhanced opportunities to realize more personalized education, and opportunities to connect with peers when learning materials are shared and jointly developed. Make sure educators recognize the opportunities of open sharing and reuse. Make use of champions, inside or outside the institution, and sharing of good practices. Points of attention and opportunities in this regard are:

- Connect the innovative features of open sharing and reuse to the demands of the educator for providing good education to make clear the *what's in it for me*;
- Publishing a MOOC (regardless of subject) can be used to boost open sharing and reuse;
- Respect good practices regarding less open sharing and reuse by educators, as long as they do not suffer any damage (for example, violation of copyright rules). These practices may serve as a starting point for a teacher's behavioral change.

### **Recommendation 2**

When changing the mindset of educators on open sharing and reuse as described under recommendation 1, organize adequate support for ICT, legal and educational aspects, make sure

sufficient time is available, create a safe space for experimentation and implement an adequate infrastructure.

### **Recommendation 3**

Formulate an institutional and faculty policy on open sharing and reuse to enable and secure the activities mentioned under recommendations 1 and 2. Connect this policy to broader educational innovations such as transition to blended learning or enhancing customization of education for individual learners. Translate these policies to influences on quality of education in the daily educational practices for the educator.

When following these recommendations, a point of attention is worth mentioning. One of the most commonly used mechanisms to introduce an innovation in an institution is to install a committee, in which all relevant categories of actors are represented. According to Dastur (2017), it is very likely that this approach will not lead to broader adoption, but on the contrary it may very likely be counterproductive. Together laggards and late majority adopters comprise 50% of the institution's population, and most likely this coalition of the unwilling will slow down or even stifle the 'bright new idea' of adopting the sharing and reuse of open resources (Dastur, 2017). Therefore, following Dastur, a better strategy is to populate committees with innovators and early adopters, since the theoretical model of Rogers (2003) "predicts that if a committee is strategically populated with innovators and early adopters, then there is a better chance for an innovation to be diffused through the entire group" (Dastur, 2017, p. 172).

### **Limitations of This Study**

In this explorative study our findings and conclusions are about sharing and reuse of OER and open online courses by educators, not about open education and/or educational technologies in general. Furthermore, it was an explorative qualitative study in which we have described and interpreted a variety of practices of sharing and reuse of open learning materials and online courses by faculty and staff in 10 Dutch public Higher Education institutions. Although most of our findings are confirmed by similar studies, more research is needed to support these findings before they can be generalized to all institutions of Higher Education in the Netherlands.

## **Conclusions**

Our study has indicated that the actual rate of adoption of open sharing and reuse of learning materials and courses in publicly funded institutions of Higher Education in the Netherlands is rather low in terms of educators involved. The concepts of diffusion of innovation (Rogers, 2002, 2003) and configuration (Elias, 1978) have provided a structure for both the interview scheme and structuring of the recommendations. Compared to similar studies on adoption that used the survey as method for data collection, some findings are different. This can be attributed to the issue of self-reporting in similar (survey) studies and the many interpretations of "open" a participant has.

Whether our findings apply to all other Dutch Higher Education institutions, and thus to the Dutch public Higher Education system, has to be established in further research. It is our contention that this study has provided the appropriate information and concepts. Hopefully, implementation of the

recommendations and the monitoring of their in and through institutions will lead to more detailed approaches, and to further adoption of sharing and reuse of open learning resources.

## **Acknowledgements**

This research was partly funded by a grant from SURF Foundation. We thank the anonymous reviewers of a previous version for their comments, enabling us to improve the paper significantly.

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July – 2018

# Open Educational Practices in Australia: A First-phase National Audit of Higher Education

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## Abstract

For fifteen years, Australian Higher Education has engaged with the openness agenda primarily through the lens of open-access research. Open educational practice (OEP), by contrast, has not been explicitly supported by federal government initiatives, funding, or policy. This has led to an environment that is disconnected, with isolated examples of good practice that have not been transferred beyond local contexts.

This paper represents first-phase research in identifying the current state of OEP in Australian Higher Education. A structured desktop audit of all Australian universities was conducted, based on a range of indicators and criteria established by a review of the literature. The audit collected evidence of engagement with OEP using publicly accessible information via institutional websites. The criteria investigated were *strategies and policies*, *open educational resources (OER)*, *infrastructure tools/platforms*, *professional development and support*, *collaboration/partnerships*, and *funding*.

Initial findings suggest that the experience of OEP across the sector is diverse, but the underlying infrastructure to support the creation, (re)use, and dissemination of resources is present. Many Australian universities have experimented with, and continue to refine, massive open online course (MOOC) offerings, and there is increasing evidence that institutions now employ specialist positions to support OEP, and MOOCs. Professional development and staff initiatives require further work to build staff capacity sector-wide.

This paper provides a contemporary view of sector-wide OEP engagement in Australia—a macro-view that is not well-represented in open research to date. It identifies core areas of capacity that could be further leveraged by a national OEP initiative or by national policy on OEP.

*Keywords:* open educational practice, open educational resources, Australian Higher Education, Higher Education policy

## Introduction

Open educational practice (OEP) is a fast-evolving but still-emerging area of study. For the purpose of this paper, OEP is “a broad descriptor of practices that include the creation, use, and reuse of open educational resources (OER) as well as open pedagogies and open sharing of teaching practices” (Cronin, 2017, p. 2).

In Higher Education, OEP can increase access to education by lowering student costs (Conole, 2013), reducing course development costs (Conrad, Mackintosh, McGreal, Murphy, & Witthaus, 2013), improving teaching collaboration (D’Antoni, 2008), and providing access to resources. This paper contributes to research exploring OEP in Australian Higher Education, by presenting key findings of a desktop audit covering 40 Australian universities. The paper first provides background by introducing existing literature, and OEP initiatives globally and within Australian Higher Education. This is followed by an overview of the study, data collection method and analysis, and the study’s findings. The paper concludes by discussing how the findings relate to current literature, the study’s practical implications, and suggestions for future research.

### Open Educational Practice: The Global Context

To varying degrees of success, OEP has gained international traction. Organisations such as UNESCO have sponsored the Paris OER Declaration (UNESCO, 2012), and the earlier Cape Town Open Education Declaration (2007), which “calls on governments worldwide to openly license publicly funded educational materials for public use.” Furthermore, UNESCO began global OER monitoring in 2016 (UNESCO, 2016), to understand impact of OER at the national level. The proposed UNESCO indicators explore national, state, and institutional policy responses to OEP, repository access and national-level curation, and staff engagement with OEP.

Most countries can provide local examples of OEP initiatives encompassing research and teaching funding, open textbook development, open course offerings, and repositories. In Canada, the British Columbia Ministry of Advanced Education, Innovation and Technology’s Open Textbook Project, cofunded with BC Campus, provided the catalyst to develop free and open textbooks for students that are now shared globally (McGreal, Anderson, & Conrad, 2015). Another significant move is the Memorandum of Understanding (MOU) on Open Educational Resources signed in 2012 by the three western Canadian provinces (British Columbia, Alberta, and Saskatchewan), which “includes cooperation among the provinces in sharing and developing OER; identifying, sharing and encouraging the use of OER; and by using technology, foster an understanding of OER issues” (McGreal et al., 2015, p. 168).

*100 Examples of President Obama’s Leadership in Science, Technology, and Innovation*, notes the US federal government “invested in openly licensed education resources” (White House, 2016). The Department of Labor invested 2 billion USD to support community college OER use (White House, 2016), and the State Department released the *Federal Open Licensing Playbook* (2017) supporting practitioner capacity-building in open licensing, especially for federally-funded outputs.

In the UK, Scotland has progressed interinstitutional OEP collaboration, starting with the Scottish Open Education Declaration (Open Scotland Initiative, 2014) and the resulting Opening Educational Practices

in Scotland project (OEPS, 2016). The United Kingdom cofunded JISC and the UK Higher Education Academy between 2009 and 2012 for sixty-five projects (JISC, 2013) to build capacity and develop OER for Higher Education. This is, however, an example of unsustainable practice—the funding was terminated in 2012 in the wake of sector-wide budgetary reductions and has not been reinstated.

African practitioners, by contrast, assert that “being part of the OER movement is not optional but a necessity for the African academic community” (Muganda, Samzughi, & Mallinson, 2016 p. 38). This is driven by limited access to universities, and to ensure that African students and academic staff develop localised resources instead of passively receiving content from other countries. Most African countries lack national policy for OEP, prompting institutional approaches to support and promote OEP (Kwame Nkrumah University of Science and Technology, 2011; Africa Nazarene University, 2015).

Lastly, OEP is gathering traction in China, supported by the Chinese ministry of education (Guo, Zhang, Bonk, & Li, 2015). This has resulted in over 20,000 open courses shared via an open source platform (xuetang online), and a focus on openly licensing Chinese research output. Despite this investment, recent research still indicates that awareness levels among Chinese Higher Education staff remain low (Guo et al., 2015).

Australian practitioners and researchers therefore have the benefit of mature OEP examples, complete with warnings about sustainability, awareness-raising, and evidence of institutional practices flourishing without explicit government funding or policy.

## Open Educational Practice and Australia

OEP is still an emerging practice in Australia (Bossu & Tynan, 2011) and whilst government departments and agencies are encouraged or mandated to adopt open principles and practices (e.g., open data, open government) the openness agenda has not yet included Higher Education despite the publically funded nature of this sector. The lack of policy levers has provided little incentive for Australian Higher Education institutions to explore OEP.

Despite this lack, Higher Education institutions have shown developing interest in OEP, demonstrated by:

- The 2014 and 2015 *Australian Higher Education Horizon Reports* (Johnson, Adams Becker, Estrada, & Freeman, 2014, 2015), which forecast a “time for adoption” for OER of three to five years.
- The report recognises that awareness is *the most significant challenge* at the policy and practice levels.
- An increase in the number of accepted papers and presentations at Higher Education conferences in Australasia (2014 Open Education Symposium, 2015 USQ OpenSpace Conference, ASCILITE, MoodleMoot, EduTech, Apple Education Conference), which demonstrates recognition of the growing need for research-based dissemination of practice

- A growing number of universities with supported OEP initiatives, for example *OEP Learning and Teaching Grants* at the University of Southern Queensland (2015–) and open professional learning *Coffee Courses* offered by the Australian National University (ANU)
- Universities beginning to reward and recognise OEP via their institutional academic promotion policy
  - For example the University of Tasmania has this year recognised OEP in its *Teaching Performance Expectations Framework*, linked to evidence required for academic promotion.
- The growing number of Australian universities joining the Open Education Resources universitas (OERu)—an organisation founded to explore and offer open, accredited courses globally—and the Open Education Consortium

However, these are all single-institution activities engaging local academic staff. The overall impact of these programs, given the additional lack of interinstitutional collaboration, will be limited in the long-term, pointing to a critical need for widespread OEP support, investment, and collaboration.

The current state of OEP engagement in Australia is disconnected and neither widely understood nor adopted. This lack of awareness manifests in recent educational policy documents such as *Keep It Clever*, which aims to set the direction and targets for the future of universities in Australia. The document asserts Australia needs to support and enable a Higher Education sector that is “nimble, adaptive and flexible” (Universities Australia, 2016, p. 5), and identifies a need to improve *accessibility, affordability, quality, and resourcing* in Australian Higher Education. The connection between these goals and OEP has yet to be recognised or supported.

### **OEP Bridging Western and Indigenous Knowledge Systems**

Australian OEP potentially addresses context-specific needs for decolonising knowledge practices and negotiating nuances in knowledge ownership. Free and open cultural licenses are a product of, and a response to, Western notions of knowledge. The Paris Declaration (UNESCO, 2012) states (Section G) the intention to:

*Favour the production and use* [emphasis added] of OER in local languages and diverse cultural contexts to ensure their relevance and accessibility. Intergovernmental organisations should encourage the sharing of OER across languages and cultures, *respecting indigenous knowledge and rights* [emphasis added] (p. 2).

Historically, respect for Indigenous Australian knowledge has been mostly absent, with a strong movement in the 1990s to halt the appropriation of cultural works (Janke, 1999). Recent projects such as *Noongarpedia* (University of Western Australia & Curtin University, 2016), the *Living Archive of Aboriginal Languages* (Charles Darwin University, 2012), the *Ara Iritija Website* (Ara Iritija Aboriginal Corporation, 1994–2016), and the *Djurrwirr Project on Bowerbird* (Bowerbird, 2014) seek to preserve language and cultural knowledge in appropriate ways.

OEP maintain their distinction via emphasis on learner-led knowledge management. In Indigenous knowledge contexts, this involves well-designed practice and interaction in an already distanced and isolated environment (Funk, Guthadjaka, & Kong, 2015; Bow, Christie, & Devlin, 2014). Adding diverse language, cultural, ontological, and epistemological differences to the context makes the use of OEP critical for learning outcomes for a range of learners, especially marginalised ones.

Opening knowledge ownership presents an opportunity to imagine how these practices could further engage those with culturally-distinct concepts of learning in a more functional dialogue about the future of knowledge management.

## Criteria for the Audit: A Review of Literature

The authors sought actionable themes of OEP—that is, criteria framing a search for sector-wide institutional evidence. Based upon a review of the literature, the criteria selected were: *strategy and policy; implementation of open content; infrastructure, tools, and platforms; professional development and support; collaboration and partnerships; and funding*. Each criterion was subdivided into indicators (subthemes) to nuance institutional experience or operationalisation of the criteria. The indicators are listed in “Findings,” below.

### Strategy and Policy

Globally, the role of government policy-makers in OEP has gained traction with the expectation that “OER will flourish when bottom-up grassroots OER development takes place in an environment supported by top-down policy” (Stacey, 2013, p. 69). Australian Higher Education is shaped primarily by government policy and target-setting; thus policy remains a strong catalyst for change.

Recent educational policy documents reflect a language of corporatisation, rationalisation focused on economic growth, and global competitiveness (Australian Government, 2016). Education is positioned as an “export,” (Universities Australia, 2016, p. 23) and increasingly regarded as an individual, rather than a social, good, whilst universities “produce career-ready, globally competitive graduates to meet...21<sup>st</sup> century labour markets” (p. 13).

Readying students to be “wealth generators” contrasts the policy of other countries, such as the United Kingdom and Canada—countries with strong OEP adoption. The United Kingdom’s “Success as a Knowledge Economy” (Department for Business, Innovation & Skills, 2016) focuses on teaching excellence, social mobility, equitable access to education, lifelong learning, and providing student choice for education, and the economic benefits of overhauling approaches to commercialising innovation (Department for Business, Innovation & Skills, 2016). The document “Canadian Universities and our digital future” (Universities Canada, 2016) focused on collaborative opportunities for students; the need for universities to respond to information abundance (where the value of information is no longer driven by scarcity); and user-centred approaches to education, research, and industry collaboration.

The Australian governments’ focus in Higher Education has been on open research and open research data, providing transparency to taxpayer-funded research grants, and improving collaboration and competitiveness internationally. Legal expectations are embedded in research funding. The Australian

government's Excellence Research Australia (ERA) reporting requirements have driven open repository implementations in universities, providing further evidence of the power of national policy on practice (Mamtora, Yang, & Singh, 2015). In the context of learning and teaching, however, government policy is notably absent (Stagg & Bossu, 2016).

### **Implementation of Open Content**

Adopting OER within a university course poses considerable practical challenges. A review of international case studies of OER uptake in Higher Education courses (Judith & Bull, 2016) found barriers in five major areas:

1. adapting material across contexts;
2. copyright issues;
3. locating context-suitable resources;
4. discoverability issues driven by diffuse nature of OER repositories; and
5. limited staff knowledge of OEP.

Although there is evidence that individual staff are adopting strategies to mitigate these challenges, unsupported individual approaches were found to have limited long-term success.

Enablers of OEP were also considered. Judith and Bull (2016) found that if long-term, systemic adoption is desired, a holistic, university-supported approach is needed. Institutional commitment to structures and processes supporting OEP offers a foundation, but tension persists between creative adaptability (an acknowledged advantage of OEP), and the perceived rigidity of institutional models.

### **Infrastructure, Tools, and Platforms**

OEP is reliant on technological connectedness for the (co)creation, storage, and dissemination of the resources. Some of the earliest OER projects created sustainable and globally-accessible repositories (such as *MERLOT*, *Temoa*, *Knowledge Without Borders*, and the *OER Commons*). As the number of OEP projects increased, institutions constructed repositories, especially as universities (certainly in Australia) invested heavily to develop spaces to store and disseminate, first, research outcomes, and then learning objects (LO) (although it is worth noting that research repositories are usually "outward facing," whilst LO repositories are "inward facing"). The Budapest Open Access Initiative (Open Society Foundations, 2002) provided recommendations for developing and providing open access (OA) to research, namely (1) increased expectations to publish in OA journals, and (2) ensuring access to research through institutional collections.

The Australian government invested 25.5 million AUD (2005-2007) in research repositories (Mamtora et al., 2015) to address digital research storage needs. A further 16.4 million AUD (2007-2010) was allocated to develop repository reporting tools and bibliometric data harvesting systems. The number of institutional repositories rose from six in 2003, to thirty-seven (95% of academic institutions) in 2008

(Kennan & Kingsley, 2009). Repositories have benefitted from not only federal government support, but also from professional bodies such as the Council for Australian University Libraries (CAUL), the Australian Library and Information Association (ALIA), and the Australian Open Access Support Group (AOASG) (Mamtora et al., 2015). Likewise, research funding organisations have begun to mandate OA to funded grant outcomes, leveraging an open access agenda for the sector.

Whilst OA research has found allies at the national level, OEP has yet to experience similar success and lacks national advocacy, policy frameworks, and incentives—perhaps indicative of a broader research/teaching divide.

### **Professional Development and Support**

The presence of mediating artefacts—that is, any mechanism or process that makes open practice explicit to a specific audience (Conole, 2013)—is a necessary factor for OEP diffusion. They include professional learning sessions, web resources, instructional guides, human resources (such as librarians and copyright officers), and the curriculum design of programs. As OEP potentially influences changes in practice, practitioners require support to contextually integrate these new approaches (Littlejohn & Hood, 2017).

Superficial development is insufficient to generate a commitment to change; OEP is inherently complex. Capacity development requires a “holistic process, involving the development of conceptual and practical knowledge, as well as the sociocultural knowledge and self-regulative knowledge to enable educators to make sense of and embed their learning in their contexts of practice” (Littlejohn & Hood, 2017, p. 500). The presence of professional development and support is thus explored in this study as part of this holistic process that includes all of the previous elements, but binds them together purposefully as a sense-making activity.

### **Collaboration and Partnerships**

Institutional, national, and international collaboration has already been recognised as one of the many opportunities of the transformative potential of OEP (Bossu, Brown, & Bull, 2014). It has previously been noted that the grants funded by the Office of Learning and Teaching (OLT) have not gained sector traction, nor have resources intended for reuse been adapted outside of the immediate context. This criterion sought to establish the degree to which collaboration in OEP occurred in the Australian environment, and the types of activities (if any) that these partnerships produce.

### **Funding**

Federal government interest is indicated by the funding of a number of OEP-related grants (2010- 2014) by the OLT (disbanded by the Australian government in 2016). The project outcomes have neither been normalised nor transferred beyond their immediate context. Projects from the last decade [with funding allocation] include:

- *Students, Universities, and Open Education* (2014) [238,000 AUD]



- This project explored the OEP integration with curriculum, specifically focused on MOOCs. A “national OEP roadmap” including eleven “signposts” for action was also developed (<http://openedo.org/>).
- *Effective open licensing policy and practice for Australian universities making online education really work* (2014) [222,000 AUD]
  - This project reviewed the copyright and legal issues challenging OEP in the business planning discipline (<http://www.oel.edu.au/>).
- *A creativity skills MOOC for Australian coursework masters students* (2013) [50,000 AUD]
  - This project implemented and evaluated a MOOC to teach and assess creativity skills. This project developed one MOOC to be repurposed or embedded in other courses, but has yet to be reused (<http://www.olt.gov.au/project-creativity-skills-mooc-australian-coursework-masters-students-2013>).
- *INSIGNIA: an open badge system for research training and supervision at ANU* (2013) [40,000 AUD]
  - INSIGNIA developed open badge strategies to support research training and supervision (<http://www.olt.gov.au/project-insignia-open-badge-system-research-training-and-supervision-anu-2013>).
- *Bridging the gap: teaching adaptations across the disciplines and sharing content for curriculum renewal* (2011) [149,243 AUD]
  - This project attempted to foster resource sharing by academics teaching Adaptation Studies. The project used an institutional repository as a catalyst for sharing resources (<http://www.olt.gov.au/project-bridging-gap-teaching-adaptations-across-disciplines-and-sharing-content-curriculum-renewal->).
- *Adoption, use and management of open educational resources to enhance teaching and learning in Australia* (2010) [220,000 AUD]
  - This project developed a feasibility protocol to enable and facilitate the adoption, use and management of open educational resources for learning and teaching within Australian Higher Education institutions (<http://www.olt.gov.au/resource-adoption-use-management-open-educational-resources>).

These projects represent almost 1 million AUD of government expenditure in OEP research; expenditure that has not been backed by meaningful policy development, or even awareness of OEP at the national level.

## Methods

The research used an exploratory literature review that informed the development of the research instrument. The major themes of the review became the *criteria* and *indicators* for a structured, repeatable desktop audit of the sector. The review of literature included international research of barriers and enablers to OEP; therefore, the resulting instrument could be transferred to other contexts by researchers.

### Research Instrument

An existing instrument for this research could not be located. The authors therefore developed one by reviewing OEP research (including government reports, research grant final reports, articles, conference proceedings, and “grey literature”). An initial version of the instrument was constructed and then revised by all authors. It was then used to collect data from three Australian universities. Refinement at each step ensured consistency and validity using it for the main study.

The instrument consists of six criteria, supported by indicators of the presence of activities, technology, or documentation that evidences engagement with the criteria. The six criteria are:

- **Criterion 1:** Strategy and policy (documentation that supports and guides the development of OEP).
- **Criterion 2:** Implementation of open content (the development of OERs and facilitation of access to OERs).
- **Criterion 3:** Infrastructure, tools, and platforms (open infrastructure that supports OEP).
- **Criterion 4:** Professional development, and support (opportunities for staff members develop their knowledge and skills of OEP).
- **Criterion 5:** Collaboration and partnerships (relationships that support OEP development).
- **Criterion 6:** Funding (funding for OEP research and implementation).

The review instrument would display either a 1 or a 0 to show, respectively, the presence or absence of each indicator. This would allow for an overall *institutional picture* to emerge. There are also spaces next to each indicator to add examples, notes, and comments (see further details in Appendix 1).

### Data Collection

Data were collected during November and December 2016. In order to identify the evidence of OEP in Australian universities, a browsing and searching procedure (using a list of predetermined search terms—our indicators) was implemented using search functions on Australian university websites. Major keywords such as *open educational practice* and *open educational resources* were also used to search using the Google search engine (see further details in Appendix 2). The data for each university was entered into a separate review instrument. After completion of all 40 reviews, a secondary review was

conducted for any indicator marked with a 0 in the first round to identify any evidence that had been previously missed or had been recently updated by the website owner.

## Data Analysis

Data from individual reviews were synthesised into a Microsoft Excel spreadsheet. A value of either 1 or 0 (i.e., “yes” or “no,” respectively) was assigned to each checkpoint corresponding to each university. Notes and observations of websites sitting alongside the check boxes were also qualitatively analysed and reflected to add explanation and sophistication to the findings.

## Findings

For the initial round of data collection, the indicators for each criterion were examined. As this audit sought national-level findings, the authors have chosen to display aggregate figures for the number of universities possessing the indicators, expressed as a percentage of the total number of Australian institutions. Individual institutions are only named when used as an example of practice for the indicator.

**Criterion 1: Strategies and policies.** Table 1 (below) presents a range of policies and strategies supporting OEP. An open-access policy was identified in 15 universities (37.5%). An open-access policy could either describe elements such as purpose, scope, definitions, and statement of policy (Australian National University, Charles Sturt University) or cover other details such as procedures, guidelines, and roles and responsibilities (Southern Cross University, University of New England). Only a quarter of the universities had documents such as OEP policies, strategic plans, strategic directions, or educational plans. Educational plans/strategies were the second most common form of this type of documentation in Australian universities. For example, the University of Southern Queensland’s *Educational Experience Plan* (2015) includes an objective to “adopt organisational artefacts such as policies, procedures, guidelines, and practices that assume openness as a core principle of education” (p.4).

Table 1

### *OEP Strategies and Policies*

<b>Indicator number</b>	<b>Criterion 1: Strategies and policies</b>	<b>No. of universities with this indicator</b>	<b>Percentage of universities with this indicator</b>
1	Open access policies?	15	37.5
2	OER/OEP policies and strategies?	10	25
3	OER/OEP guidelines?	6	15
4	Innovation in educational practice programs?	5	12.5
5	IP rights and copyright	4	10

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	framework for OER?		
6	Open learning and teaching strategy documents?	4	10
7	Recognition and reward policies?	4	10
8	OER/OEP initiatives?	3	7.5
9	Community engagement policies?	3	7.5
10	An open pedagogic model?	2	5
11	A vision for OER/OEP?	1	2.5
12	A business model promoting OER/OEP?	1	2.5
13	Open learning and teaching policies?	1	2.5
14	Open licensing policies?	0	0
15	Open assessment frameworks?	0	0
16	Open quality assurance frameworks?	0	0

No Australian university had open licensing policy, open assessment, or a quality assurance framework to support OEP. Very few institutions displayed specific documentation that would support OEP such as open learning and teaching policies and business models promoting OER/OEP. The University of Tasmania is the only institution that had these two documents. Similarly, the University of Southern Queensland was the only institution to articulate a vision for open education. Its *Annual Report 2016* states the university pursues a “vision to offer open and flexible Higher Education opportunities locally, nationally and internationally” (p. 2).

**Criterion 2: Implementation of open content.** Table 2 (below) shows the breadth of engagement with OER. Almost two thirds (26 of 40, or 65%) of universities were using or facilitating access to OER. Universities that did provide users with a modest number of OER simply provided a list of links to the sources (Griffith University, Murdoch University), whereas other provided OER subject guides (via the library), or curated discipline-specific OER collections (Charles Darwin University, University of South Australia).

Table 2

*Implementation of Open Content in Universities*

<b>Indicator number</b>	<b>Criteria 2: Open educational resources</b>	<b>No. of universities with this indicator</b>	<b>Percentage of universities with this indicator</b>
17	Using/accessing OER?	26	65
18	Open courseware and content?	21	52.5
19	Creating, sharing, and managing OER?	17	42.5
20	Free educational courses?	11	27.5
21	Open ebooks?	2	5
22	Developing/applying open pedagogies?	2	5
23	Other open learning materials?	2	5

Open courseware and content, was found in over a half of all universities (52.5%), and often linked to MOOCs. Courseware and content might be of different types, such as in syllabi, lectures, course outlines, and readings, and in audio, video, textual, and graphical formats. On the contrary, it was found that three OER types, open e-books (Charles Sturt University, La Trobe University), open pedagogies, and other open learning materials (University of Southern Queensland, University of Tasmania) were the least present (5%).

**Criterion 3: Infrastructure, tools, and platforms.** In relation to infrastructure, institutional repositories were used in all universities—except one—to manage learning resources, research outputs, and other work produced by students and staff. Most of these digital repositories were based on an open software program (such as Equella) or another open platform. However, most of these repositories were designed to contain closed, copyright-protected resource (such as course readings).

Table 3

*Open Infrastructure, Tools, and Platforms*

<b>Indicator number</b>	<b>Criteria 3: Infrastructure, tools, and platforms</b>	<b>No. of universities with this indicator</b>	<b>Percentage of universities with this indicator</b>
24	Institutional repositories (learning materials and objects)?	39	97.5
25	Facilitating/participating in MOOCs (cMOOCs, xMOOCs)?	28	70

26	Use of Web 2.0/social media (e.g. wikis, blogs, social networking sites, etc.) for OEP related activities?	16	40
27	Tools and resources for creation of OER?	14	35
28	Open software tools (e.g. learning management systems)?	12	30
29	Other open tools/platforms?	9	22.5
30	Tools and resources being used for OER/OEP?	5	12.5
31	Open content management systems?	5	12.5
32	Technologies to support hosting and management of OER?	4	10

*Note:* The term cMOOC refers to connectivist Massive Open Online Courses, and particularly the learning design employed. A cMOOC privileges learner-learner interaction, sharing, creating, and curating resources, and reflection as a tool to enhance learning. An xMOOC is more instructivist in design, and is predicated on learner-content, and learner-instructor interactions to facilitate learning experiences (McGreal, Anderson, & Conrad, 2015)

MOOCs were offered by 28 universities (70%). The number of MOOCs per institutions ranged from single offerings to over two dozen. MOOC platforms were also diverse, including Coursera, Open2Study, EdX, and FutureLearn; some institutions offered MOOCs on up to two or three platforms.

Universities might also use open-source software for the hosting and management of OER, content management and other open platforms. However, these technologies were used less than proprietary software packages.

**Criterion 4: Professional development and support.** The most common type of professional learning to support OEP were online tutorials (55%), mainly presented as informational web page text or (less commonly) video. Organising OEP seminars/workshops to raise awareness and encourage staff engagement mainly related to Open Education Week, and Open Access Week, with little evidence of activities in the other fifty weeks of the year.

Table 4

*Professional Development and Support for OEP*

<b>Indicator number</b>	<b>Criteria 4: Professional development and support</b>	<b>No. of universities with this indicator</b>	<b>Percentage of universities with this indicator</b>
33	Guidelines and tutorials on OER/OEP?	22	55
34	OER/OEP national and international activities and events?	13	32.5
35	Other supporting and guidance materials?	10	25
36	OER/OEP coordinator/support officer?	8	20
37	OER/OEP capacity building programs?	5	12.5
38	Legal, technical and pedagogic support for staff?	3	7.5
39	Other support services?	3	7.5
40	Other professional development activities for staff?	3	7.5
41	Support mechanisms for lecturers to develop OEP?	0	0

It is noteworthy that more specific, staff-targeted support mechanisms used to foster OEP development were under-represented in the desktop audit findings. This could indicate that institutions saw it as unnecessary to openly publish information relating to support strategies, and the supporting resources. Support related to legislation (intellectual property and copyright), technical aspects (using open source technologies), and pedagogical support (OER-curriculum integration) was likewise almost absent. This is not surprising as the publicly-available register of OER-related policy and guidelines is small in Australia (POERUP, 2015). This mirrors a 10% global increase in OER policies between 2012 and 2017 (Commonwealth on Learning, 2017). The absence of this information in a desktop audit doesn't eliminate the possibility of practice at an individual or departmental level.

**Criterion 5: Collaboration/partnerships.** More than two thirds of universities (72.5%) collaborated with at least one party to foster OEP. Some partnered with other universities, organisations, or companies to create or improve their experience of openness in education. As an illustration, Charles Sturt University partners with an industry-based education company to develop a unique series of online master’s degree qualifications.

Table 5

*OEP Partnerships*

<b>Indicator number</b>	<b>Criteria 5: Collaboration/partnerships</b>	<b>No. of universities with this indicator</b>	<b>Percentage of universities with this indicator</b>
42	Involved in any partnerships?	29	72.5
43	Cross institution partnerships?	10	25
44	Partnerships within an institution?	9	22.5
45	National/international partnerships?	4	10
46	Other alliances?	1	2.5

Specifically, some universities resourced a specific team responsible for innovation in teaching and learning, which could provide technical support to faculties and teaching staff to develop courses (i.e., MOOCs). For example, the University of Wollongong (UOW) had an Open UOW team; the University of Queensland (UQ) had a UQx project team; and Charles Darwin University had an Innovative Media Production Studio.

A noticeable point is that some universities partnered with MOOC providers or open online course providers such as edX, OERu, Coursera, FutureLearn, and Open2Study. Among universities who are in building OEP partnerships, the Universities of Wollongong, Southern Queensland, and Tasmania are notable, having strong relationships with established online learning partners. However, it must be noted that engagement with MOOC platforms is not a guarantee of engagement with OEP. Whilst most MOOCs have no barriers to participation, few are developed with free and open resources, or allow free and open (re)use of this content (Czerniewicz, Deacon, Walji, & Glover, 2017).

**Criterion 6: Funding.** Half of the universities provided access to funding opportunities through general schemes (i.e., schemes that are open to a wide range of disciplines and people rather than dedicated to OEP), however only 7.5% have implemented schemes that mention OEP directly (University of Southern Queensland, Sydney University, Charles Darwin University). Those with access to general schemes allowed practitioners to apply within eligible grant areas such as innovation in learning and teaching, or curriculum transformation.



Table 6

*Sources of Funding for OEP*

<b>Indicator number</b>	<b>Criteria 6: Funding</b>	<b>No. of universities with this indicator</b>	<b>Percentage of universities with this indicator</b>
47	Other funding opportunities?	20	50
48	Previous grant applications?	6	15
49	Internal grants schemes?	3	7.5
50	External grants schemes?	2	5
51	Institutional financial support for OER/OEP?	1	2.5

Only one university was located that implemented an OEP-specific internal grant. Beginning as an *Open Textbook Grant* in 2015, these were altered in 2016 to *Open Educational Practice Grants*, linked to the university’s vision “to offer open and flexible Higher Education opportunities locally, nationally and internationally” (University of Southern Queensland, 2016, p. 2). This type of financial support has been recognised in previous OEP research as an institutional strategy to positively recognise efforts, encourage innovation, and redesign of current learning and teaching practices (Bossu, Brown, & Bull, 2014).

## Discussion of Findings

### Strategies and Policies

Given the funding environment and government levers for open access to knowledge generated in Higher Education, it is perhaps surprising that only 37.5% of institutions had a publically-accessible open-access policy. In addition, the findings did not show a clear correlation between policies and activities that universities implemented. In the second phase of this research (detailed in “Further Research Directions,” below) further investigation will be undertaken to ascertain if this number is correct and if a correlation exists. What this does highlight, however, is that Australian open practice requires maturation to embrace a multi-faceted, institution-wide view of OEP. This is evidenced by a general lack of policy (75% of institutions with no visible policy), lack of recognition of OEP in reward and recognition (90% of institutions do not have this), and that ninety percent of universities have no stated position on intellectual property and OEP. Furthermore, the lack of vision, business models, and targeted initiatives create an environment in which OEP struggles for a basic level of awareness among practitioners. The sector needs to recognise that all of these aspects require holistic attention that values the interrelated role of each facet in creating an inter- and intraconnected whole. Developing individual components of strategy and policy in isolation is neither sustainable nor supportive of OEP.

### Open Educational Resources

Despite the lack of policy, initiatives, or reward and recognition schemes, well over half (65%) of institutions show either use of or encouragement to access OER. The high proportion of universities (52.5%) offering open courseware shows a desire to engage in OER, though the rationale for this activity is rarely made clear. The second-phase data collection will seek to establish nuances of practice—namely, whether OEP experiences a high level of engagement despite the lack of explicit institutional support.

Of particular interest is the centrality of the library in mediating access to OER (through library subject guides, or curated open content), which shows an opportunity for sector-wide collaboration and leadership among library and information professionals through bodies such as the Australian Library and Information Association (ALIA) and the Council of Australian University Libraries (CAUL), neither of which have statements supporting OEP. Academic librarianship is intrinsically linked to the location and evaluation of information resources for study and research; thus mediating artefacts are a simple extension of professional activities.

### **Infrastructure**

The near-ubiquitous presence of the institutional repository (97.5%) was unsurprising. Used to store research output and reusable learning objects, the purpose was usually focused inward on the institution to which it belonged. Seventy percent of universities had engaged with MOOCs, and 35% had tools to support the creation of OER, but only 10% had invested in technology that allowed the institution to share the resulting content. This could point to a trend of “dark reuse” (Wiley, 2009) in Australia. This refers to the anticipated behaviour wherein practitioners use OER, but do not openly share the resulting works with a broader open community (but rather share only within the institution).

Returning to the previous point about the complexity of OEP, repositories seem to be an institutional asset disconnected from overall OEP. The high level of infrastructure investment to meet government requirements for research have become popular for learning and teaching resources, and yet the same level of access and transparency are not evident. Again, this illustrates the need for a deeply connected alignment of the institution in practice and activity as part of a broader practitioner ecosystem that nurtures sector-wide OEP.

### **Professional Development and Support**

Conole’s (2013) assertion that “mediating artefacts” are required to understand, engage with, and contribute to OEP underpins both professional development and support of university staff. Some of these mediating artefacts (subject guides, curated collections) have been supplied by librarians, but these refer primarily to asynchronous, web-based resources. Human resources seem to be lacking across the sector; only 20% of universities employ staff within specific OEP roles, 12.5% have developed programs dedicated to OEP capacity-building, 7.5% have legal or pedagogic support for practitioners, and universities offering professional development activities represent only 7.5% of the sector. This low investment in human resources is perhaps indicative of the level of integration between OEP and university visions, strategies, and policies.

## Collaborations/Partnerships

Collaboration within the sector appears strong, with 72.5% of institutions maintaining partnerships with an external organisation that supports OEP, and 25% of institutions maintaining a partnership with another university that supports OEP. This does, however, illuminate a level of insularity of Australian practice, as only 10% of Higher Education institutions engage in national- or international-level partnerships that foster OEP.

## Finance

In terms of internal schemes and financial support for emerging and established practitioners, only 7.5% of institutions offered internal grants that could be applied to OEP initiatives, and 2.5% provided direct financial support for OEP. Australian practitioners find greater funding opportunities outside of their institution, with 50% of universities directing staff to external bodies.

## Implications for Practice

This presents a landscape in which policy and strategy are not present to support OEP, but it does also recognise examples of nascent open educational practices emerging across the sector. In this stage of Australian OEP development, it is reasonable to describe OEP progress as succeeding “through the heroic efforts of a dedicated team, rather than repeating proven methods of an organization with a mature software process” (Paulk, Curtis, Chrissis, & Weber, 1993). This description represented some of the earliest work in understanding how isolated information and communication technologies (ICT) projects become embedded, sustainable, optimised activities, rather than ancillary systems supported only by the dedication (and often ideologically-driven goodwill) of a small cohort of staff. Whilst drawn from a different discipline, this challenge is present in efforts to mainstream OEP.

A core component to repeating proven methods is collaboration. A review of the criteria and indicators of this instrument demonstrates that evidence is drawn from a wide range of institutional stakeholders: library, ICT, academic staff, learning designers, senior managers, media producers, professional learning staff, and positions specifically dedicated to OEP. The implication, therefore, is that for OEP to become sustainable and repeatable at the institutional level, stakeholder commitment needs to be front-ended in the process. This would represent a sectoral shift from a focus on OER (the creation, storage, and dissemination of learning resources) to a culture of OEP (understanding the elements of the environment that foster openness and committing to practices that support openness as a whole-of-institution value and activity). Essentially, “[this understanding] of the concept of OEP is that it does not separate the resource from its usage, but takes into account the interplay between stakeholders, organisational elements and resources” (Ehlers & Conole, 2010, p. 6).

Returning to Paul Stacey’s earlier quote highlighting the expectation that “OER will flourish when bottom-up grassroots OER development takes place in an environment supported by top-down policy” (2013, p. 69), OEP stakeholders are perhaps in a position of both bolstering OEP activities institutionally, whilst advocating for top-down policy. Policy, however, must be approached cautiously and carefully in this environment, ensuring that grassroots autonomy inherent in OEP is not subsumed within a

compliance-based or mandated policy structure. This balance, perhaps, represents one of the major challenges for the future of OEP.

## Further Research Directions

The findings of this paper are based on a desktop audit of publically-visible evidence of engagement with OEP, which presents a specific perspective of OEP in Australian Higher Education. As the first phase of this research, the authors acknowledge that other data sources may be available but protected by institutional log-in, which raises implications for the degree to which a university subscribes to openness as an operational value. A more nuanced understanding will arise from the second phase research, during which semistructured interviews will be conducted with representatives from a sample of universities. These interviews will aim to develop contextual understanding of the data from the desktop audit and seek deeper rationale for institutional behaviours surrounding OEP. At this stage, just under 25% of Australian universities have committed to follow-up interviews.

The questions arising from this initial review focus on whether indicators such as institutional vision, strategy, and policy are prerequisites for OEP, and to what extent OEP can flourish in environments when these documents are absent. A more integrated understanding of the larger environment in which OEP operates will be sought, as well as any practices, enablers, or barriers that are perceived as uniquely Australian. This initial phase does, however, indicate that Australian OEP in Higher Education requires further maturation before it can be viewed as widespread or sustainable.

## Conclusion

OEP is still an emerging practice in Australian Higher Education. This paper presented key findings from a desktop audit seeking to establish a national picture of OEP in Australian universities. The findings presented here are the first part of a larger project and will be complemented by interviews with key stakeholders working within Australian universities. As they stand, the findings suggest that Australian universities are beginning to engage with and adopt OEP, but further maturation and cultivation at multiple levels is needed for OEP to be sustainable and to have the desired impacts. The findings reveal that more empirical research is needed to develop a richer and more nuanced understanding of openness in Australian Higher Education learning and teaching. By building a strong empirical research base we will be better placed to inform policy, practice and culture in Australian Higher Education.

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## Appendix 1

### Audit of Open Educational Practice

Date: November 2016

University name:

Website:

No.	Categories/Check points	Yes	No	Examples/URLs	Notes/Comments
<b>I.</b>	<b>STRATEGIES &amp; POLICIES</b>				
1	A vision for OER/OEP?				
2	OER/OEP policies and strategies?				
3	Open access policies?				
4	Open licensing policies?				
5	OER/OEP initiatives?				
6	Innovation in educational practice programs?				
7	OER/OEP guidelines?				
8	IP rights and copyright framework for OER?				
9	A business model promoting OER/OEP?				
10	An open pedagogic model?				

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11	Open learning and teaching policies?				
12	Open learning and teaching strategy documents?				
13	Community engagement policies?				
14	Recognition and reward policies?				
15	Open assessment frameworks?				
16	Open quality assurance frameworks?				
<b>II.</b>	<b>OPEN EDUCATIONAL RESOURCES</b>				
17	Using/accessing OER?				
18	Creating, sharing, and managing OER?				
19	Open courseware and content?				
20	Open e-books?				
21	Free educational courses?				
22	Developing/applying open pedagogies?				
23	Other open learning materials?				
<b>III.</b>	<b>INFRASTRUCTURE/TOOLS/PLATFORMS</b>				
24	Institutional repositories (learning materials and objects)?				
25	Tools and resources for creation of OER?				
26	Tools and resources are being used for				

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	OER/OEP?				
27	Technologies to support hosting and management of OER?				
28	Open software tools (e.g. learning management systems)?				
29	Open content management systems?				
30	Facilitating/participating in MOOCs (cMOOCs, xMOOCs)?				
31	Use of Web 2.0/social media (e.g. wikis, blogs, social networking sites, etc) for OEP related activities?				
32	Other open tools/platforms?				
<b>IV.</b>	<b>PROFESSIONAL DEVELOPMENT &amp; SUPPORT</b>				
33	OER/OEP coordinator/support officer?				
34	Guidelines and tutorials on OER/OEP?				
35	OER/OEP national and international activities and events?				
36	OER/OEP capacity building programs?				

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37	Legal, technical and pedagogic support to staff?				
38	Support mechanisms for lecturers to develop OEP?				
39	Other supporting and guidance materials?				
40	Other support services?				
41	Other staff professional development activities?				
<b>V.</b>	<b>COLLABORATION/PARTNERSHIP</b>				
42	Involved in any partnerships?				
43	Partnerships within an institution?				
44	Cross institution partnerships?				
45	National/international partnerships?				
46	Other alliances?				
<b>VI.</b>	<b>FUNDING</b>				
47	Institutional financial support for OER/OEP?				
48	Internal grants schemes?				
49	External grants schemes?				
50	Previous grant applications?				
51	Other funding opportunities?				
<b>Total “yes” and “no” answers:</b>					

## Appendix 2

### List of Search Terms (OER/OEP Audit)

Annual report

Blended learning

Collaborations

Community development

Community engagement

Community outreach

Content management systems

Curriculum development

Distance education

Distance learning

Funding

Grants

Guidelines

Innovation

Institutional repository

Intellectual property rights

International cooperation

Learning design

Learning management systems

Licencing

Mobile technology

MOOCs

OEP

OER

Open access policies

Open content

Open education

Open educational practices

Open educational resources

Open licencing policies

Open practice

Open technologies

Openness

Participatory technologies

Partnerships

Policy

Professional development

Social inclusion

Strategic plan

Strategies

Textbooks

Vision



July – 2018

## The Impact of the Flipped Classroom Model on Students' Academic Achievement



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### Abstract

The aim of this study is twofold. First, it aims to investigate the impact of the Flipped Classroom (FC) Model on students' academic achievement. Second, it reveals the students' opinions about the model itself. For four weeks, the students in the experimental group were taught in a blended learning context where the FC Model was applied, while the lessons in the control group were carried out through traditional blended learning. Both groups were administered a test before and after the Flipped Classroom sessions. To analyze the data, a two-way ANOVA for Mixed Measures was conducted to compare the means of test scores of each group. The results showed that there were no statistically significant differences between the scores of the two groups. Coming to classes prepared and completing the assignments in class, so that students did not need to do assignments at home, were among the positive aspects of the FC Model. The problems encountered in this model, however, are categorized under three main titles: Motivation, Content, and Learning. At the end of the study, the advantages and disadvantages of the FC Model are identified in accordance with the participants' opinions, and necessary suggestions made.

*Keyword:* flipped classroom, students achievement, Khan Academy



## Introduction

The use of the flipped classroom as an alternative to the traditional learning environments has been increasingly attracting the attention of researchers and educators. The advancement in technological tools such as interactive videos, interactive in-class activities, and video conference systems paves the way for the widespread use of flipped classrooms (Johnston, 2017). It is even asserted that the flipped classroom, which is used to create effective teaching environments at schools, is the best model for using technology in education (Hamdan, McKnight, McKnight, & Arfstrom, 2013). Studies about the flipped classroom appear in different disciplines including information systems (Davies, Dean, & Ball, 2014), engineering, sociology, and humanities (Kim, Kim, Khera, & Getman, 2014), mathematics education (Zengin, 2017), and English composition (Zhonggen, & Wang, 2016).

### Who's Flipping?

The FC Model is a new pedagogical model where the instructor shares predetermined digital resources with students through a platform outside the classroom, and related content is also taught through this outside platform asynchronously (Bergmann & Sams, 2012). Inside the classroom, active, collaborative, and interactive problem-solving activities and consolidation practices are carried out (Toto & Nguyen, 2009). Thus, learners are more active in the class, internalizing the contents through a wide range of classroom tasks (Crouch & Mazur, 2001). Bishop and Verleger (2013) contended that a flipped classroom is an educational technique which consists of two significant components: (1) the use of computer technologies such as video lectures and (2) the involvement of interactive learning activities.

Moreover, lessons should include four major components in order to be entitled as the Flipped Classroom (Flipped Learning Network [FLN], 2014). First, educators should restructure the learning environment and time in a flexible way, considering the individual and group expectations and needs. Second, instructors need to teach the contents in detail, adopting a learner-centered approach and provide rich learning opportunities and activities reflecting a particular learning culture for the specific groups of students. Third, educators should regularly keep track of the difficulty level of the contents and the notes taken by the students as well as their progress, and they also apply active learning strategies that will maximize conceptual understanding of the students. Finally, the instructor should be a professional educator who continuously monitors students in their learning processes, immediately provides feedback, and assesses students' outputs.

Studies in related literature show that videos are often used as a means of teaching outside the classroom, while interactive tasks in which the students are actively participating are used as in-class activities (Basal, 2015; Graziano, 2017; Herreid & Schiller, 2013; Hsu, 2017; Lage, Platt, & Treglia, 2000; Roehling, Root Luna, Richie, & Shaughnessy, 2017; Song & Kapur, 2017; Zengin, 2017). Active participation and student-centered learning can be ensured through the use of videos that maintain students' attention and enable them to concentrate on the content (Herreid & Schiller, 2013). Taking advantage of the technology, instructors both create video materials and make use of the open access videos available on the Internet (Sherer, & Shea, 2011).

With the help of the instructor or their classmates, the students engage in the application-oriented learning activities to apply the theoretical knowledge (FLN, 2014). What is expected from the students

in the classroom is to interact with the instructor and their peers, apply and practice the knowledge, and to use the opportunities provided to improve their learning performance and higher order thinking skills (Wiginton, 2013). In other words, it is fundamental that instructors apply active learning strategies to enable learners to manage their responsibilities, self-regulation, and learning process (Wiginton, 2013).

The essential principle of FC Model is to ensure better comprehension and consolidation of the content, which is learned by the students outside classroom, under the guidance of the instructors inside classroom (Herreid & Schiller, 2013). After having concentrated on the topics while listening to the lectures or watching the videos outside the classroom, the students internalize them with the help of practical applications and interacting with the instructor in the classroom.

### **Impacts of the FC on Student Learning**

In recent studies, the impacts of the FC Model on student performance, engagement, learning outcomes, and motivation have been investigated. Studies have shown that the FC approach enhances student's learning performance (Baepler, Walker, & Driessen, 2014; Davies et al., 2013; Janotha, 2016; Sun & Wu, 2016; Talley & Scherer, 2013; Wiginton, 2013; Zengin, 2017; Zhonggen & Wang, 2016), produces enhanced learning outcomes (Chen Hsieh, Wu, & Marek, 2017; Gillispie, 2016; Kong, 2014; Smallhorn, 2017) and increases student motivation (Chyr, Shen, Chiang, Lin, & Tsai, 2017; Graziano, 2017; Smallhorn, 2017; Wiginton, 2013; Yilmaz, 2017).

Although most of the research suggests that the FC Model positively impacts students' learning, there are also studies which have not revealed anticipated positive effects. For example, Smallhorn (2017) did not find an observable increase in students' academic achievement. In another study conducted by Kim et al. (2014), they stated that there was no evidence that the FC Model contributed to increased student grades. Similarly, in a study by Sun and Wu (2016), the use of the FC Model did not impact teacher-students interaction and learning satisfaction.

### **Flipped Classroom and Students' Academic Achievement**

In recent years, several research studies have focused on the impacts of FC learning environments on students' academic achievements, one of which was conducted by Zengin (2017). In this study, the learning environment was designed using the FC Model alongside Khan Academy and free open source software (Zengin, 2017). The aim of this research was to investigate the impact of the FC Model on students' academic achievement and reveal their opinions about this model (Zengin, 2017). The participants of the study included 28 students in the Mathematics Teaching Program at a state university in Turkey, and the results of the study revealed that the FC learning environment, designed using both Khan Academy and mathematics software, doubled the students' academic success (Zengin, 2017). Moreover, it was found out that this learning approach facilitated student learning, enabled visualization in mathematics teaching, and contributed to permanent learning (Zengin, 2017).

In their mixed methods research, Zhonggen and Wang (2016) investigated the effectiveness of the FC Model on English writing courses. The data of the study were collected through a scale of satisfaction, a Business English writing test, and a structured interview (Zhonggen & Wang 2016). As pre- and post-tests, they administered the scale of satisfaction and a Business English writing test (Zhonggen & Wang 2016). The findings showed that members of the experimental group, who were taught using the

FC Model, scored higher on the aforementioned scales than the control group members, who were taught in a traditional learning environment (Zhonggen & Wang 2016).

To illustrate the effectiveness of the FC Model, Janotha (2016) examined to what extent FC teaching affected the academic achievement of nursing students. The participants in the experimental taught through FC Model and control groups taught through traditional pedagogy were administered a national standardized test and Council of Health Education System tests (Janotha, 2016). The test scores of the experimental group gained from the national standardized test were compared to those of the control group, and it was seen that the students in the experimental group achieved higher academic performance than the students in the control group (Janotha, 2016).

FC learning environments can also contribute to teachers' pre-service learning, skills, and affective development, specifically by creating a meaningful and authentic context for learning. Graziano (2017), for instance, conducted a study to uncover the benefits of the FC Model for pre-service teachers, its impacts on students' success, and the difficulties of the model. It was observed that learners were more productive and enthusiastic to participate in flipped lessons (Ray & Powell, 2014). Firstly, this study is significant as relevant literature reveals that although there is an increase in studies related to the FC model throughout the world, there are a limited number of studies done in Turkey. Secondly, this study is significant because to the best of the researcher's knowledge, it is the first experimental study about the impact of FC Model on students' academic performance. Therefore, it is believed that it will contribute to a better understanding of the model and its effects on teaching and learning. Moreover, the findings of this particular study can contribute to develop FC Model-oriented courses in educational settings.

Although this model addresses to the needs and wants of students in the 21st century and offers contemporary solutions to current pedagogical problems, it is fundamental that more in-depth research be carried out to investigate the effectiveness of the FC Model. Despite the fact that many studies have been conducted on FC learning environments, there is not sufficient number of qualitative and quantitative studies regarding the impacts of this new field of study on the students' academic achievements, teaching processes, and learning process. Therefore, in order to identify the effects of the FC Model on students' academic achievement, this study aims to answer the following research questions:

1. To what extent does the Flipped Classroom Model affect students' academic performances?
2. What are the opinions of pre-service teachers about the Flipped Classroom Model?

## Method

According to Johnson and Onwuegbuzie (2004), by not being limited to a single method of research, the researcher can answer their research questions comprehensively and thoroughly. Since quantitative data draw the overall picture of a problem, qualitative data is essential to reveal explanatory details (Johnson & Onwuegbuzie, 2014). Therefore, this study was designed using a mixed-methods approach. The independent variables of the research are flipped classroom and traditional teaching approaches while the dependent variable is students' academic achievements. The study included two groups of participants (Table 1). First group was the experimental group who was

taught using FC Model, and the second was the control group who was taught in a traditional learning environment. In both groups, courses were carried out in a blended learning environment, where each week, one hour of the course was conducted face-to-face and three hours were carried out online. The students' academic achievements were measured by administering a test before and after the treatment.

Table 1

*Design of the Study*

		Pretest	Treatment (4 week)	Posttest
Experimental	R	Achievement Test	X <sub>FC</sub>	Achievement Test– Focus-group interview
Control	R	Achievement Test	X <sub>TL</sub>	Achievement Test

Note. R = Unbiased Assignment; X<sub>FC</sub> = Flipped Classroom; X<sub>TL</sub> = Traditional Learning.

**Participants of the Study**

The participants of the study consisted of 59 pre-service teachers studying in English Language Teaching and Turkish Language Teaching Programs, who were taking a "Computer I" course in the 2015-2016 Academic year. Before the treatment, all the participants received training for basic computer skills to avoid possible problems in effective use of computers throughout the experimental process.

The students were randomly assigned to the groups making sure that each group included students from both programs. At the beginning of the research, there were 67 students; however, eight participants were excluded from the study group at the end of the research because they either did not carry out the out-of-class activities, they did not participate in the classroom practices for one or two weeks, or they missed the posttest.

In the end, there were 28 students in the experimental group (22 female, 6 male students; 18 ELT students, 10 TLT students) and 31 students in the control group (27 female, 4 male students; 14 ELT students, 17 TLT students). Table 2 summarizes the information about the participants of the study.

Table 2

*The Information About the Participants of the Study*

	English language teaching(ELT)		Turkish language teaching(TLT)		Total	
	f	%	f	%	f	%
Flipped learning	18	64	10	36	28	47
Traditional Learning	14	45	17	55	31	53
Total	32	54	27	46	59	100

Note. f = Number of participants.

**Content and the Procedure**

The necessary learning environments were designed for both groups to carry out the treatment. The general features of these learning environments are shown in Figure 1.

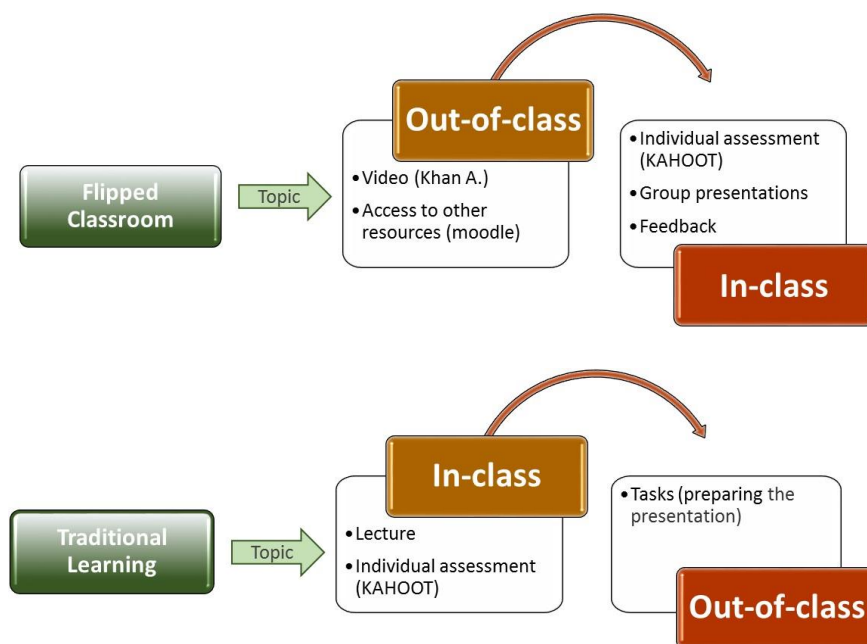


Figure 1. Features of learning environments for experimental group (flipped classroom) and control group (traditional learning).

### Experimental Group (Flipped Classroom)

Studies conducted on the FC Model (Chen Hsieh et al., 2017; Herreid & Schiller, 2013; Lage et al., 2000; Song & Kapur, 2017) have led to the development of an Appropriacy Form for the flipped learning environment. This form includes in-class activities which focus on not only sub-skills such as remembering, understanding and applying, but also higher order thinking skills such as analyzing, evaluating, and creating as defined by Anderson (2005). To increase the validity of the form, five field experts were consulted for their opinions and suggestions about the form content, appropriacy, and comprehensibility. Based on their suggestions, necessary corrections and alternations were done. Accordingly, in-class and out-of-class activities were designed as shown in Table 3 and Figure 1.

Table 3

#### *Appropriacy Form for Flipped Learning Environment*

	<b>Out-of-class activity (Video, Khan Academy)</b>	<b>In-class activity</b>
Week 1	What is information theory? (3.16 min.) History of the alphabet (9.55 min.) The Rosetta Stone (4.43 min.)	Individual assessment: KAHOOT Group presentations, Topic: The Development of alphabet
Week 2	Source encoding (4.53 min.) Visual telegraphs (9.19 min.) Morse code and information age (10.5 min.)	Individual assessment: KAHOOT Group presentations, Topic: Tools used to transfer knowledge

Week 3	Symbol rate (5.02 min.) Introduction to channel capacity (6.09 min.) Assessing knowledge (11.16 min.)	Individual assessment: KAHOOT Group presentations, Topic: The Capacity of knowledge in digital environment
Week 4	A mathematical theory of communication (4.29 min.) Information entropy Compression codes (4.14 min.) Error codes (5.19 min.)	Individual assessment: KAHOOT Group presentations, Topic: The Factors facilitating knowledge transfer in today's world

Throughout the procedure, course materials were provided through an online learning platform provided by Khan Academy. Khan Academy presents itself as a resource for individual learning where anybody can improve themselves via personalized education (Khan Academy, 2016). Videos presented to the students within our study were titled “Computer Science” and were retrieved from the “Computer World” category of the Khan Academy webpage (Khan Academy, 2016). As it is difficult to find high-quality, elaborate videos on the Internet, instructors prefer videos produced by resources such as Khan Academy (Herreid & Schiller, 2013).

### Out-of-Class Activities

In accordance with the weekly topics, URL addresses of the videos with the learning contents were sent to the students. The students were expected to come to the classroom prepared and having watched the assigned videos. Figure 2 illustrates one of the videos entitled “What is Information Theory?” under the category of “Learn/Computer World/Computer Science/Journey into Information Theory” (Khan Academy, 2016).

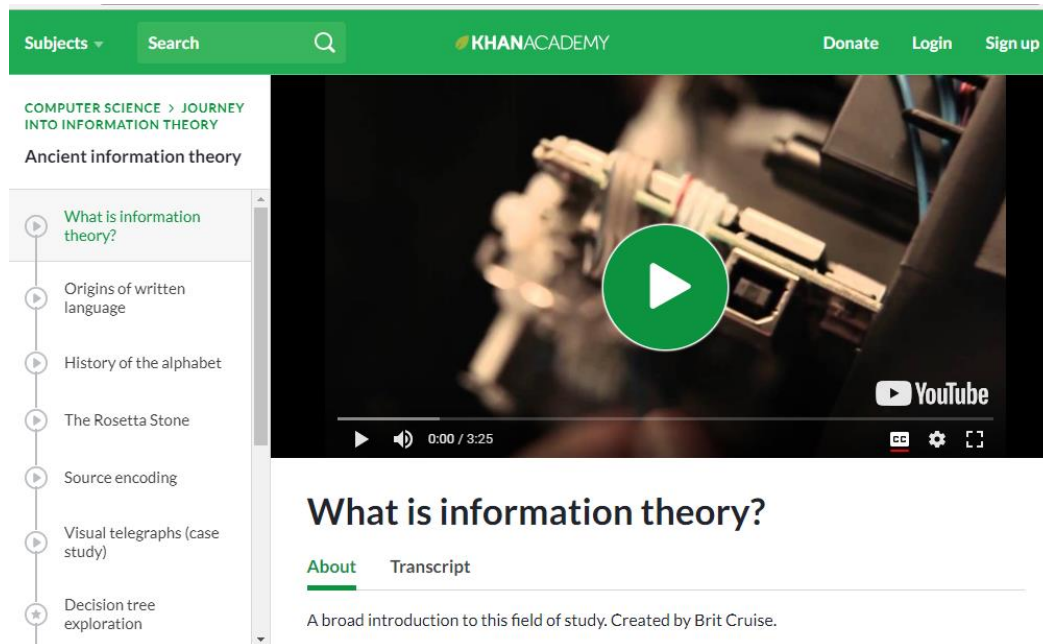


Figure 2. Screenshot of a video view. From “What is Information Theory?” by Khan Academy, 2016 (<https://www.khanacademy.org/computing/computer-science/informationtheory/info-theory/v/intro-information-theory>).

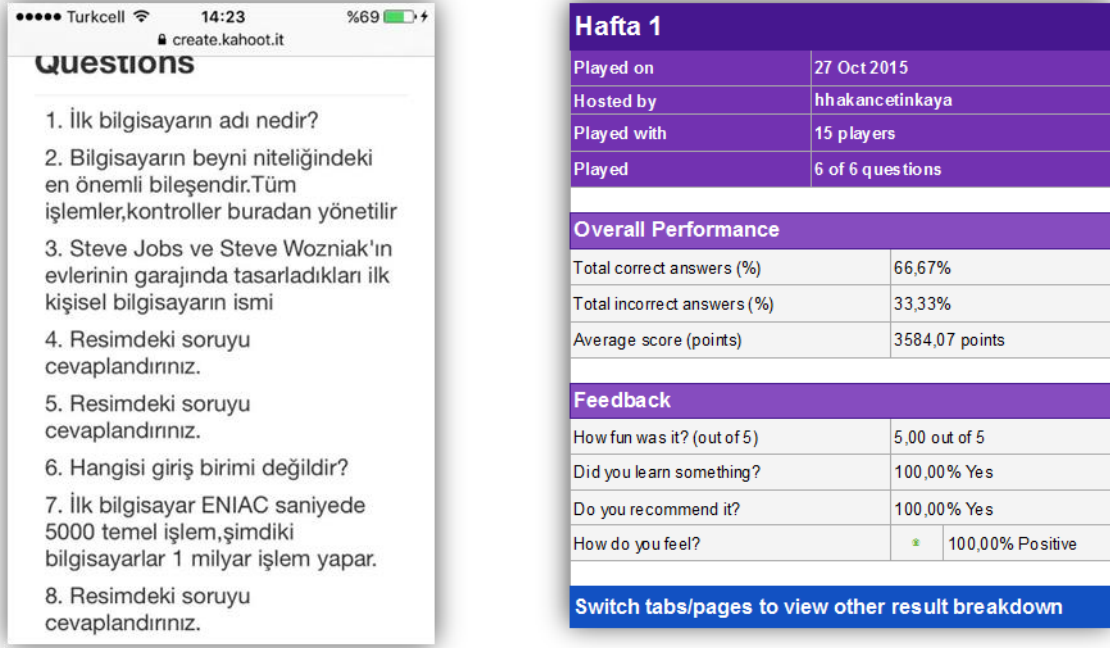


Figure 3. A screen-shot sample of questions and results view. From “Kahoot Mobile App” by Kahoot Application, 2016 (<https://kahoot.com/mobile-app/>).

### In-Class Activities

In-class activities included individual assessments and group presentations. Classes began with multiple-choice tests, comprised of five or ten questions about the contents learned outside of the classroom. The students logged in to the Kahoot application with their student numbers, using their smart phones to reach the interface and see the test uploaded into the system by the instructor. The students were expected to answer the questions within an allocated amount of time and send their responses through the same system. When the response time for each question ended, the correct answer and the students' own responses were projected. After all of the questions were responded to, the instructor shared the correct answers with the students using projection.

For the group presentations, at the beginning of the term, students were divided into groups of four. Within groups, each student was assigned one of the following roles: group leader, group presenter, writer, or reporter. Group members exchanged their roles weekly so that every student could perform each role at some point throughout the procedure. The groups were assigned a different topic each week and required to make a presentation within a given time period in the classroom (Table 3). Therefore, every student actively participated in the learning process inside the classroom.

### Control Group (Traditional Learning)

The learning environment for the control group was organized in such a way that they were taught differently from the experimental group. Namely, out-of-class activities shown in Table 3 were applied in the classroom, and the in-class activities were done outside the classroom. The contents of the videos presented to the experimental group were lectured to the control group students by the instructor in the class. At the end of the lesson, the control group students were administered the multiple-choice test via the Kahoot application and evaluated on the system. The activities that the

experimental group did in class, were given as outside-of-class assignments to the control group, and students were expected to prepare a presentation related to the research question. Unlike the experimental group, in which presentations were done in groups, the control group was required to prepare assignments individually. The students were assigned to make presentations individually about the topic of the week.

### **Data Collection Tools**

In this study, multiple data collection tools were used. An achievement test was used to answer the first research question. Focus group interviews, on the other hand, were used to respond the second research question.

### **Achievement Test**

In line with the time allocated to each topic, the appropriate number of questions was determined, and 25 multiple-choice items were written. These questions were compiled in a question pool and were evaluated by three field experts and an expert in the field of measurement and evaluation. Certain changes and revisions were done to some of the items based on the expert opinions. One item was excluded from the interview questions. Moreover, in accordance with the suggestions of the expert in measurement and evaluation, the items which tested the same topic were categorized together and sequenced in a linear way. Negative statements were avoided as much as possible, and if there were any, they were highlighted in the questions. In addition, the distracters were prepared appropriately. The experts also evaluated the questions to ensure whether they were compatible with the learning outcomes and taxonomy.

The achievement test which ultimately included 22 multiple-choice questions was administered to 58 students, item analysis was run, and a simple item analysis table was formed. The test items were prepared in such a way that they distinguished between students who are knowledgeable, and those who are not, or between masters and non-masters students. The analysis revealed no items with negative item discrimination. Among all the items, only two had a lower item discrimination index (i.e., 0.3 and 0.29). The item difficulty index, however, was 0.42 and 0.41. After consulting our experts' opinions and doing the necessary revisions, the items were kept in the test. For the internal reliability of the test, the Kuder–Richardson Formula 20 (KR-20) was run, and reliability coefficient was found 0.74, which indicates internal reliability.

### **Focus-Group Interview**

All of the interview questions were developed after a detailed literature review in the relevant field, and piloting. In qualitative studies, to increase the validity of the results, it is crucial that the researcher directly quote the opinions of the participants and use these quotes to discuss the findings (Yıldırım & Şimşek, 2008). The findings should include the participants' words rather than subjective statements of the researcher (Lincoln and Guba, 1985). In our study, dense description was used in order to ensure transferability, which shows the validity of the focus group interview questions. The coded data was examined for their conformability. In the analysis procedure, a coding list was formed, and these codings were peer reviewed. After the analyses, another expert coded and interpreted some parts of the interview data by means the same coding list. The results of the two analyses were compared, and the differences were discussed and negotiated.



After the treatment was completed, the researcher formed groups of four or five and asked open-ended questions to the students. To ensure reliability and validity of the focus group interview questions, expert opinions were also consulted. A total of 18 students participated in the focus group interviews including 4 male and 14 female students. The interviews were audio recorded, and the duration of these interviews ranged from 7 to 13 minutes. To reveal the opinions of the participants about the FC Model, the following questions were asked during the focus-group interview.

- How much study time (how many hours) per week did you allocate for your out-of-class lessons?
- What did you specifically do in order to learn the topics outside the classroom?
- What are the positive aspects of the Flipped Classroom for you?
- What is the application that you like the most in this model?
- What are the problems you have encountered in FC Model?
- What solutions do you suggest to solve the problems experienced?

### Data Analysis

A 2x2 split-plot design was used to analyze the quantitative data. Two-way ANOVA for Mixed Measures was used to designate the main effects for column and row factors and their interaction effect related to the effectiveness of the experimental study (Büyüköztürk, 2016). The qualitative data gathered through the focus-group interviews, however, were analyzed through descriptive analysis. In line with descriptive analysis techniques, the data were organized according to the themes (general themes and sub-themes) that emerged from the interview questions and research questions. Moreover, while listing the results of the study, direct quotations were also provided from the participants' responses to the interview questions because in descriptive analysis it is important to make use of direct quotations from the participants' and discuss the findings based on these quotations to ensure validity (Yıldırım & Şimşek, 2008).

## Results

### The Impacts of the Flipped Classroom on Students' Academic Achievement

An unrelated t-test was performed to identify whether there were any statistically significant differences between the pre-test scores of the two groups. Table 4 displays the results of the unrelated t-test.

Table 4

*The Results of the Unrelated T-test According to the Pre-test Scores of the Groups*

Measurement (Group)	<i>n</i>	<i>M</i>	<i>SD</i>	<i>SE</i>	<i>t-test</i>	<i>p</i>
Experimental	28	3,5000	1,13855	57	0.71	0.478
Control	31	3,2903	1,11396			

Note.  $P < .05$ ; n, the number of students; M, arithmetic average; SD, standard deviations; SE, standard error.

Table 4 displays that there were no statistically significant differences between the mean scores of the students ( $t(57)=0.71, p>0.05$ ). Based on this finding, it can be stated that both groups can participate in the experimental process. Table 5 shows the standard deviation values and the means of the pre- and post-test scores of the students in the experimental and control groups.

Table 5

*Achievement Test Scores of the Experimental and Control Groups*

Groups	Pre-test		Post-test	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Experimental	58.33	18.976	55.29	16.11
Control	54.84	18.56	56.64	14.79

Note. SD, standard deviations; M, arithmetic average.

As observed in Table 5, while the pre- and post-test mean scores of the experimental group decreased (from 58.33 to 55.29), the mean scores of the control group increased (from 54.84 to 56.64).

The findings related to whether the changes in the students' scores show statistically significant differences depending on the FC Model and traditional blended-learning are shown in Table 6. Accordingly, no significant differences were found in the means of the pre- and post-test scores of the two groups ( $F_{(1,57)} = 0.926, p < 0.05, \eta^2 = 0.016$ ). To identify the effect size and the significance of the differences between each of the groups, eta square ( $\eta^2$ ) was examined. According to Cohen (1988), if  $\eta^2 < .02$ , it is grouped as small. Since the effect size was found to be small ( $\eta^2 = 0.016$ ), it can be said that different learning environments explain a very small part of the total variance of the academic performance.

Table 6

*The Results of ANOVA on the Students' Pre- and Post-test Scores in Accordance With the FC Model and Traditional Learning*

Variance Source	SS	df	MS	F-value	P	$\eta^2$
Between-Groups	23001.37	58				
Group(Experimental/Control)	33.54	1	33.54	.083	.774	0.001
Error	22967.84	57	402.94			

Within-Groups	10852.71	59				
Measurement /Pre-test/Post-test)	11.33	1	11.33	.061	<b>.807</b>	0.001
Group*Measurement	173.32	1	173.32	.926	<b>.340</b>	0.016
Error	10668.05	57	187.156			
Total	21694.08	117				

Note.  $P < .05$ ; ANOVA, analysis of variance; SS, sum of squares; df, degrees of freedom; MS, mean square ;  $\eta^2$ , measure of strength of relationship (eta squared) ; n, the number of students.

In other words, the difference between the mean scores of the students learning through the FC Model and traditional blended learning was not statistically significant. There was even a small decrease observed in the mean scores of the students taught through FC as seen in Table 5.

### What are the opinions of the pre-service teachers regarding the FC Model?

**How much study time (how many hours) per week did you allocate for your out-of-class lessons?** The students were asked how much time they studied outside the classroom. Out of 18 students, 16 stated that they spent one-two hours studying outside the classroom, 1 student reported spending three-four hours, the other student four-five hours.

**What did you specifically do in order to learn the topics outside the classroom?** When the students were asked what they specifically did in order to learn the topics outside the classroom, 14 of them expressed that they watched videos, and 10 students stated they revised and summarized the topics (See Table 7). Revision and summarization are specifically used learning strategies.

Table 7

#### Pre-Service Teachers' Opinions

Question	Answer	F
What did you specifically do in order to learn the topics outside the classroom?	I watched the suggested videos.	14
	I revised and summarized the topics.	10
	I did not do anything extra.	1
What are the positive aspects of Flipped Classroom for you?	We come to the class prepared.	4
	I do not need to do assignments outside the class.	4
	We learn the topic outside the class and consolidate them in the class.	2
	It is fun to do the assignments as a group in the classroom.	2
	I do not think it has a positive aspect.	1
What is the application that you like the most in this model?	Kahoot	12
	Khan academy videos	2
	Moodle	1
	Group work	1

Note. F, number of students.

**What are the positive aspects of the flipped classroom for you?** When the students were asked about the positive aspects of the FC Model, four students stated they could come to the

class prepared. Following this answer, they expressed that other positive aspects included that they did not have to do assignments outside the classroom, and that they learned the topic outside the class and consolidated this learning in the class. One student emphasized the fact that doing assignments as a group in the class was more enjoyable than doing assignments individually outside the classroom. Furthermore, another student indicated that self-learning enabled her to increase her self-confidence by saying, "I gained the courage and pleasure that I myself can understand a topic which is totally new to me, and if I want to, I can comprehend and learn it better."

**What is the application that you like the most in this model?** As can be seen in Table 7, the application that students (12 students) liked the most in FC Model was Kahoot. The students found it enjoyable to log in this application through their smart phones or Internet-enabled computers at the end of each topic in the classroom to evaluate their own performances. Additionally, two students stated that they enjoyed Khan Academy videos, one student expressed positive feelings towards Moodle, and one from the group works.

**What are the problems you have encountered in FC Model?** The students were also asked what problems they encountered while learning through the FC Model. The rest of the answers were categorized under three major themes (See Table 8). Accordingly, eight students stated they experienced motivation problems; nine students encountered problems related to the lesson content, and four students encountered problems related to learning. Six students said they did not experience any problems.

Table 8

*Problems Encountered in the FC Model*

Category	Problem	F
Motivation	I did not want to put an effort on it.	3
	I felt burn out.	3
	The topics were boring and unnecessary.	2
Content	The topics were difficult, so I could not understand.	3
	The resources were not sufficient.	5
	There were many terms.	1
Learning	I had time constraints, so I could not study.	3
	I had difficulty relating the topic of the lesson to my field of study.	1
Other	I did not encounter any problems.	6

*Note.* F, number of students. Problems listed are direct quotes from participants.

**What solutions do you suggest to solve the problems experienced?** As for the possible solutions to the problems they experienced, four students responded, "Instead of studying the topics outside the classroom, I would like to learn them from the instructor." The other answers from three students are as in the following:

- "Actually, I do not want to do the assignments outside the classroom. Since I do not have a serious environment, I constantly procrastinate and cannot concentrate. I am in favor of learning the lesson and doing the activities in the class."
- "Instead of video lecturing, the instructors can teach us in the classroom, then we can watch the videos later at home."
- To teach the lesson and carry out the activities in the class since students never do the assignments."

Lastly, the students were also asked what their opinions were to further improve this model. Five students reported that the instructor should explain the topics to study at home, and three students stated that they should be provided with more resources for out-of-class study.

## Conclusion

The main purpose of this study is to investigate the impacts of the FC Model on students' academic achievements. To this end, two study groups were formed: an experimental group including students learning through the FC Model, and a control group including participants taught through traditional blended learning. Before the four-week treatment procedure, a relational t-test was run, and it was found out that there were no statistically significant differences between the groups. To reveal the impacts of the FC model on the students' academic achievement, a two-way ANOVA for Mixed Measures was used to see whether there were significant differences between the pre- and post-test scores of the experimental group and control group. The results indicated that there were no statistically significant differences between the scores of each group. Namely, the findings showed that the use of the FC Model does not yield significant impacts on increasing the students' academic achievement. Only a few other studies supporting this finding (Kim et al., 2014; Smallhorn, 2017). Conversely though, the results of related studies in the relevant literature reflect that the FC Model increases students' academic success (Janotha, 2016; Pierce & Fox, 2012; Talley & Scherer, 2013; Zengin, 2017).

Alongside the positive and negative impacts of the FC Model, the reasons why the results of this study were not compatible with those of the previous research in the field were also identified by reviewing the focus-group interviews. These interviews revealed that the total study time of the students outside the classroom was only 1-2 hours. According to this finding, it is seen that the working time of the students outside the class is 1-2 hours. Besides, it was stated that they watched the videos assigned and suggested in order to learn the topics outside the classroom. While studying, they used learning strategies such as revising and summarizing the contents. Learning strategies are the strategies which promote individuals' self-learning process. They consist of behaviors and thoughts that are expected to affect the way learners choose, organize, and integrate the new information to learn (Weinstein & Mayer, 1986). As cognitive learning strategies, the rehearsal strategy involves repetition, and elaboration includes summarization (Pintrich, 2000). The findings of this particular study show that while learning within the FC Model, the pre-service teachers are successful at using rehearsal and elaboration learning strategies. In line with this finding, Wiginton (2013) asserts that using learning strategies to ensure student responsibility, self-regulation, and autonomous learning are among the FC Model's advantages.

According to the students, coming to classroom prepared and completing the assignments in the class so that they do not have to do them at home are among the positive aspects of this model. Moreover, doing the assignments as a group under the guidance of the instructor motivates the students. Sun & Wu (2016) emphasized positive impacts of group work done in the class on the students' performances. In fact, they revealed that classroom interaction (within the context of group work) positively impacts students' academic achievements (Sun & Wu, 2016). Studying autonomously and reaching their goals on their own help students gain the feeling of self-confidence. According to Chyr et al. (2017), for example, flipped learning practices could be helpful for students' participation, self-efficacy, and self-directed learning. Moreover, relating the contents to real life is likely to attract the students' attention (Kong, 2014). With this information in mind, we suggest that images in the videos used within a FC reflect the classroom environment, and that activities should be organized on the basis of the learners' needs and interests.

Our findings also reveal that in general, students resist learning the topics on their own outside the classroom in the FC Model. Instead they prefer learning the topics from the instructor inside the class. The problems encountered in this model can be categorized under three main titles: Motivation, Content, and Learning. As reported by our participants, in a new learning environment, students who are typically willing to put effort into learning tend to have difficulty getting motivated. The students studying outside the classroom stated they experienced problems regarding the difficulty of the contents and insufficiency of the resources. Among the other problems were lack of time to study outside the class, difficulty in understanding the topics, and learning difficulty. In their research, Chen Hsieh et al. (2017) pointed out that many students had difficulties adapting to the FC Model since it is a new approach. Most of the students stated that the course included heavily-loaded requirements, and they did not have time to watch the videos outside the class (Chen Hsieh et al., 2017).

Siegle (2014) also puts forward a similar idea in his study. Siegle asserts that students may not be successful at completing the learning contents while watching the videos outside the classroom. Moreover, students' motivation problems may result from the low readiness level for e-learning. In a study conducted by Yilmaz (2017), the relation between motivation and readiness level was examined. It was found out that students' e-learning readiness level was a significant predictor of their satisfaction and motivation (Yilmaz, 2017). Apart from the effectiveness of the FC Model, Yilmaz asserts that there is a need to identify students' readiness level for e-learning in order to increase their satisfaction and motivation.

Even if the instructors have problems in producing videos appropriate to the student's level (Siegle, 2014), they can both create video materials benefitting from the advantages of technology and make use of open-access video materials available on the Internet. Moreover, it is suggested that instructors use Khan Academy videos. The students' opinions show that it can be beneficial to use Kahoot as an assessment tool, and Khan Academy videos as video materials. Another suggestion is that instructors should provide a brief explanation in the class about the assignments that the students are supposed to complete outside the classroom.

This study is limited in the sense that it was carried out with a small number of students taking the "Computer I" course. Similar research should be conducted with a larger sample, in different courses, and at different levels of education, so that it will be possible to generalize the findings. Moreover,

using different data collection tools in addition to the pretest, posttest, and focus group interview may yield a more in-depth and multi-faceted analysis of the students' opinions and academic achievements. Furthermore, it is recommended that students' motivation and readiness level to learn outside the classroom be identified and necessary arrangements be done before applying the FC Model. Lastly, rich content videos should be chosen and produced specifically for students to consult for out-of-class studies.

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July – 2018

## Technology Matters – The Impact of Transactional Distance on Satisfaction in Online Distance Learning



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### Abstract

Transactional distance (TD), the perception of psychological distance between the student and his peers, his instructor/teacher, and the learning content, has long been a prominent construct in research on distance education. Today, distance education primarily takes place over the internet, with technology mediating engagement and communication. Because transactional distance in online distance learning will always rely on technologically-mediated communication or interaction, we argue that in order to get the full picture, this aspect of technological mediation needs to be considered. For this purpose, we introduce a new scale for measuring transactional distance between students and the learning technology (TDSTECH), comprised of two interrelated dimensions. Reliability, convergent, and discriminant validity suggest a suitable scale. Preliminary inferential analyses are conducted with multiple linear regression and mediation analysis. Regression models show that TDSTECH is the single most important predictor of satisfaction in this population. This may have important implications for practitioners trying design and facilitate satisfying online distance learning experiences. Also, mediator analysis reveals that TDSTECH mediates the relationship between TD student-teacher and satisfaction, but not for TD student-content. Surprisingly, TD student-student shows no significant relationship with satisfaction. Implications for practice and further research are discussed.

*Keywords:* transactional distance, learning technology, satisfaction, distance education, online learning

## Distance Education

The latest online learning report by Allen and Seaman (2016) shows that enrollment in distance education is still growing, with a rate of 3.9%. In 2014, 5.8 million US students were enrolled in distance education, one half of which are learning in a fully online environment. Even though distance and online learning is still growing and there have been innovative developments in recent years (e.g., MOOCs & OER), typical problems persist. One such problem is the high level of persistence necessary to successfully complete online and distance classes (Allen & Seaman, 2014). As a result of this, attrition rates in online and distance education are higher than in face-to-face settings. Since comparing attrition between these very different settings is not trivial (Allen & Seaman, 2014), there are only estimates. According to some scholars, attrition rates for online learning may be as high as 75% (Croxtton, 2014). This has been especially prominent in MOOCs where course completion may be as low as 6.5% (Jordan, 2014).

Given that convenience and flexibility regarding time and location of learning are often put forward as major advantages of online learning, high attrition rates are even more striking. There are many studies identifying factors that influence dropout rates in online and distance learning (Willging & Johnson, 2009; Croxtton, 2014; Kauffman, 2015; Adamopoulos, 2013; Selim, 2007; Park & Choi, 2009). However, one very intuitive and straightforward variable, satisfaction, has been shown over and over again to be positively associated with persistence in online distance learning (Levy, 2007; Schreiner, 2009; Park & Choi, 2009; Joo, Lim, & Kim, 2011; Joo, Lim, & Kim, 2013; Lee & Choi, 2013). Hence, it seems to stand on firm empirical ground that students who are more satisfied with the online learning experience are less likely to drop out. Although the exact mechanism of this relationship is not yet fully understood, for example, how satisfaction actually results in higher persistence, motivation has been put forward as a possible explanation (Joo, Lim, & Kim, 2011). In this understanding, a student satisfied with online learning will experience higher motivation to continue, and thus is less likely to drop out.

The relationship of satisfaction with persistence is important for online distance learning research, because satisfaction is a variable easily quantified. Other possible factors related to dropout do not always lend themselves to easy measurement, for example, scheduling conflicts, family issues, financial problems, technical issues, academic integration (Park & Choi, 2009). These factors may be hard to measure but systematically improving them may be even harder, especially because some are largely outside of the realm of instructional design, educational technology, or even learning research (e.g., family issues, financial problems). Therefore, exploring ways to systematically improve satisfaction is a rather straightforward and arguably more fruitful avenue to improving persistence.

## Transactional Distance

Transactional distance, an influential concept in distance education, proposed by Moore (1993), refers to the degree of psychological distance between learner and teacher. It suggests that, although separation by space and time is the most prominent characteristic of distance education, transactional distance is the actual guiding principle in distance education, influencing the process of teaching and learning. Transactional distance may also be perceived in face-to-face education, as it is a relative rather than an absolute term. The extent to which transactional distance will be perceived by the learner is a function of three variables, dialog, structure, and learner autonomy (Moore, 1993).

Depending on how these variables manifest, transactional distance will be higher or lower, allowing for a typology of educational programs. For example, an increase in structure is expected to reduce dialog, leading to higher transactional distance. The concept of transactional distance has been hugely influential in distance education (1888 citations of Moore (1993), according to Google Scholar), and has since been applied to different contexts, for example, online learning and e-learning (Chen, 2001; Benson & Samarawickrema, 2009; Goel, Zhang, & Templeton, 2012). Gokool-Ramdoo (2008) suggests that it may well be the most promising contender “for a global theory for further development of distance education” (p.1). However, there has been criticism. For example, Gorsky and Caspi (2005) argue that empirical support is limited and that propositions of transactional distance theory may be reduced to a tautology.

Analyzing educational programs in regard to their dialogue, structure, and learner autonomy has been one method of researching the basic tenets of transactional distance theory. In this line of research, transactional distance is estimated from the extent to which these variables are manifest in a given educational program. As such, it is an indirect approach to measuring transactional distance, because the actual unit of analysis is the students’ perspective (Goel, Zhang, & Templeton, 2012). Consequently, other scholars have conceptualized transactional distance as a psychometric construct, directly measuring perceived transactional distance through self-report (Chen, 2001; Zhang, 2003; Goel, Zhang, & Templeton, 2012; Paul, Swart, Zhang, & MacLeod, 2015; Ekwunife-Orakwue & Teng, 2014). Based on Moore’s (1989) classic typology of interaction in distance education, some self-report scales now differentiate between transactional distance of student and teacher (TDST), student and student (TDSS), as well as student and content (TDSC). Measuring these sub-constructs of perceived transactional distance is a worthwhile endeavor because large transactional distance will “prohibit students’ active engagement with learning in the online course” (Zhang, 2003, p. 80). Anderson’s (2003) equivalency theorem suggests that meaningful learning is supported when at least one of these forms of interaction is at a high level and the learning experience will be perceived as even more satisfying if more than one form of interaction is at high level. Consequently, satisfaction with the learning experience will be higher if transactional distance is lower. Recently, Swart, MacLeod, Paul, Zhang, and Gagulic (2014) developed Relative Proximity Theory in order to compare actual perceptions of transactional distance in a course with a subjectively “optimal” course. The resulting relative proximity allows for systematic improvements of the learning experience.

Since transactional distance in online distance learning will always rely on technologically mediated communication or interaction, we argue that, in order to get the full picture, this aspect of technological mediation needs to be considered.

## **Transactional Distance of Student and Technology**

Hillman, Willis, and Gunawardena (1994) highlighted the paradoxical situation that although distance education, as well as online education today, relies on technology to transport communication and content, the influence these technologies may have is neglected. To fill this theoretical gap, they propose “Learner-Interface Interaction [as] a process of manipulating tools to accomplish a task” (p. 34). They propose that a students’ basic ability to interact with the necessary technology is expected to facilitate or hamper other interactions, thereby influencing the learning in a meaningful way.

Subsequently, Chen (2001) and Zhang (2003) developed measures to assess the transactional distance of the learner and the interface or technology (TDSTECH). Chen (2001) showed that this sub-construct is correlated with, but distinct from, the other constructs of transactional distance. Zhang (2003) found a weak but significant relationship between overall transactional distance and TDSTECH. In a study building on Zhang (2003), Paul et al. (2015) present a revised and more parsimonious version of the transactional distance scale, with only 12 items. This scale predicted more than half of the variance of satisfaction ( $R^2=0.586$ ). Additionally, the authors find that TDSTECH may no longer be a relevant sub-construct, as “most respondents gave such high rankings to these items that the items no longer serve any purpose” (Paul et al., 2015, p. 374). They go on hypothesizing that the items, originally written in 2003, may no longer be relevant because technology, especially web-based, has become even more commonplace today and no longer posits a challenge to most users.

However, recent research shows that the technology used in online learning and distance education does indeed still matter and may have profound effects on the learning experience. For example, Thoms and Eryilmaz (2014) showed that different software used to deliver instruction and manage interaction had an impact on satisfaction, student-student interaction, and the learning community, implying an effect on student-student transactional distance. Sun (2016) finds that support, accessibility, and usability of the course technology predicted satisfaction through the instruction-technology fit. Here, instruction-technology fit consists of the interplay between TDSTECH and TDSC, together explaining most of the variance in satisfaction ( $R^2=0.765$ ). Howard, Ma, and Yang (2016) using data mining on a very large dataset ( $N=8,817$ ) found that computer self-efficacy was one of two main factors related to positive and negative engagement with digital technologies. The relevance of computer self-efficacy suggests that digital technologies used for learning have by no means become so intuitive and commonplace that the transactional distance relating to this, TDSTECH, has become irrelevant.

Based on this recent research, we hypothesize that TDSTECH is not only still relevant for the assessment of transactional distance but may actually be key in understanding how transactional distance is related to satisfaction with the learning experience. Hillman et al. (1994) suggest this by noting that the interface is a mediating element in all interaction, implying that the other interactions will depend, to some extent, on a students’ ability to successfully engage with technology. Analogously, we suggest that TDST, TDSS, and TDSC will be, to some extent, dependent on TDSTECH and it will be a mediator between these sub-constructs and satisfaction.

## **A New Scale for TDSTECH**

In the original conception of student-interface interaction by Hillman et al. (1994), the extent to which this interaction will take place is determined by the student on one hand and the interface on the other. In this sense, learner-interface interaction is determined by “the user’s interpretation of the interface’s perceived actions and visible structure, which form the basis for understanding the interface, predicting its future behavior, and controlling its actions” (p. 34). This makes intuitive sense, because a potential impetus may originate from the students’ abilities, for example if he or she is inexperienced, but it may also originate from the technology itself, for example, if it lacks sufficient usability. Accordingly, we suggest that the amount of perceived transactional distance between student and technology will be determined by two factors: (1) the basic proficiency of the student in using the necessary technology, as well as, (2) the design and functionality (e.g., usability) of the technology

itself, as perceived by the student. Transactional distance is expected to emerge at the interplay of these two factors. Of course, they are related in the sense that perceptions of usability will change with proficiency and also in the sense that different degrees of usability make different demands on the learner's proficiency. In order to reflect these two factors of TDSTECH, we sought to identify items that represent the proficiency of a student in using technology, as well as items that reflect the perceived usability of the technology.

For the first part, we sought items that would adequately capture the basic proficiency of the student in dealing with relevant technology for learning, for example, internet, word processing, and the learning management system Moodle. We referred to an existing scale that had been previously validated, the Online Learning Readiness Scale of Hung, Chou, Chen, and Own (2010). The dimension of "Computer & Internet self-efficacy," understood as "the individuals' perception of using a given technology and individuals' ability to use the technology, that is, assessment concerning computer/network self-efficacy" (Hung et al., 2010, p. 1082), seemed to fit our conception of learner proficiency. The three items related to this dimension showed adequate composite reliability (0.736), as well as convergent and discriminant validity. To provide a better fit for the context of this research, one of the items was adapted slightly to encompass proficiency in using Moodle, instead of the very broad term "software for online learning" (Hung et al., 2010, p. 1088).

For the second part we found no adequate and previously validated items. Hence, we referred to the concept of usability, as defined by the International Organization for Standardization (ISO), in order to generate items that reflect this factor. Usability as a concept tries to capture the quality of the user's experience (Bevan, Carter, & Harker, 2015) and is classically defined as "the extent to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency and satisfaction in a specified context of use" (International Organization for Standardization [ISO], 1998). Here, effectiveness refers to "the completeness and accuracy with which users achieve specific goals" (Green & Pearson, 2006, p. 68). Applied to the context of online distance learning, a technology is perceived as effective for learning if a student is able to use it in a way that is helpful in reaching a learning goal. He/she may perceive Wikipedia as effective for finding relevant information for his studies, or he/she may perceive asynchronous threaded message boards as ineffective for natural communication with his peers. Efficiency adds to this by introducing resources needed (e.g., time, energy) into the equation. A tool or website may be effective towards a learning goal, but if a student spends too much time navigating or finding the relevant information, efficiency will be perceived as low (Green & Pearson, 2006). Satisfaction is defined as "freedom from discomfort, and positive attitudes towards the use of the product (ISO, 1998). A student will indicate satisfaction with technology, if in the process of using it towards a learning goals, he/she associates a positive attitude with the technology.

We sought to identify items that reflect the guidelines of effectiveness, efficiency, and satisfaction. To this end, we generated an item pool of 24 face-valid items, expected to be extensive in covering these dimensions. Then, four independent raters were briefed on the definitions of effectiveness, efficiency, and satisfaction in this context and were asked to flag items that they thought to be at odds with these definitions. Three items that were independently flagged by every rater were then deleted. In another round, the same four raters were then asked to identify from the remaining 21 items the items that best reflected these dimensions of usability. This resulted in an inter-rater reliability of  $k=0.69$  (Fleiss' Kappa; substantial, Landis & Koch, 1977). After discussing the unclear items, the raters agreed on nine items, three for each dimension of usability.



This resulted in a preliminary TDSTECH scale with a total of 12 items, with items 1-3 representing the students' proficiency in using technology for learning and items 4-12 representing the usability of the technology. All items can be found in Appendix D.

## Research Questions

Based on these considerations, there are four research questions for this study. The first one is concerned with the old TSTECH scale of Zhang (2003). We try to replicate the finding of Paul et al. (2015), the scale being obsolete with today's generation of students, via inspection of Kurtosis and factor structure. Based on these previous findings, we expect the scale to be obsolete (H1). This is true, if the data shows high kurtosis ( $>2$ ). This then would indicate a need for a new scale to measure this construct. Research question two is concerned with assessing the relationship between the different forms of transactional distance and satisfaction, in order to understand the relative importance of these predictors. Based on the findings of Paul et al. (2015), we hypothesize that TDST, TDSS, and TDSC will all be predictors for satisfaction (H2). This will be assessed via multiple linear regression. The third research question concerns the reliability and validity of the new TDSTECH scale. This will be assessed through Cronbach's Alpha and Principal Component Analysis. Since we have no way of predicting this, there are no hypotheses regarding this research question. The fourth research question is concerned with how TDSTECH is related to the other sub-constructs and satisfaction. We expect TDSTECH to be a predictor of satisfaction (H4.1) and TDSTECH to be a mediator for the relationship of TDST, TDSS, and TDSC with satisfaction (H4.2). The hypotheses are derived from the definitions of the constructs and their suggested relationships based in the literature review. These hypotheses will be tested via linear multiple regression and bias corrected bootstrapping mediator analysis, respectively. Note, however, that these analyses have to be considered tentative, as TDSTECH has not been previously validated on a different dataset.

**RQ1:** How relevant is the old TDSTECH scale?

**H1:** The items of the old TDSTECH scale are outdated and have little informational value.

**RQ2:** How are TDST, TDSS, and TDSC related to Satisfaction?

**H2:** TDST, TDSS, and TDSC are significant predictors for Satisfaction.

**RQ3:** What is the reliability and validity of a new TDSTECH scale?

**RQ4:** How is TDSTECH related to TDST, TDSS, TDSC, and Satisfaction?

**H4.1:** TDSTECH is a significant predictor for Satisfaction.

**H4.2:** TDSTECH is a mediator for the relationship of TDST, TDSS, and TDSC with Satisfaction.

## Data Collection

Data was collected from 141 students in a large distance university in Hagen, Germany. Students were undergraduates in either Psychology or Educational Science and participated in the class “Instructional Technology and Media” in which a total of 550 students were enrolled. Students self-selected into the survey. They were able to participate either through an URL link in the online learning environment or through a pen-and-paper questionnaire in a face-to-face class. Table 1 shows demographics of this sample.

Table 1

### *Demographics of the Sample for This Study*

Demographics						
Gender	Female (87.3%)		Male (11.3%)		n/a (1.4%)	
Online vs Print	Online (78.9%)		Print (21.1%)			
Study	Educational Science (61.3%)		Psychology (38.7%)			
Age	26 and younger (28.9%)	26 - 35 (31.7%)	36 - 45 (31.7%)	46 - 55 (22.5%)	56 - 65 (4.2%)	66 and older (0.7%)

The items for TDST, TDSS, and TDSC were taken from Paul et al. (2015). The satisfaction scale from Weidlich and Bastiaens (2017) was used for this study. Table 2 shows an overview of scales in this study.

Table 2

### *Scales Used in This Study*

Variable name	Validated	#items	Cronbach's alpha
Satisfaction	Weidlich & Bastiaens (2017)	6	0.82
TD Student-Teacher (TDST)	Paul et al. (2015)	4	0.85
TD Student-Student (TDSS)	Paul et al. (2015)	5	0.92
TD Student-Content (TDSC)	Paul et al. (2015)	3	0.72
TD Student-Technology (TDSTECH)	-	12 (11)	0.88 (0.87)

## Analysis

### RQ1

Upon analyzing response patterns for the transactional distance student-interface (TDSI) scale (Zhang, 2003) on this dataset, it became clear that, similar to findings of Paul et al. (2015), some items are problematic. Item 6 and 8 show kurtosis values larger than 2 (2.96 and 2.41, respectively). For both items, respondents choose the highest values (4 and 5) in most cases (88% and 89.4%, respectively). Also, for item 5, no values smaller than 3 were chosen at all. Upon inspection of the items (“I don’t like using the internet,” “the technology used in this course is difficult to learn,” “I feel comfortable using the computer”) it becomes clear that these items may be outdated and no longer apply for learners today. This replicates the findings of Paul et al. (2015). H1 is supported.

### RQ 2

Linear multiple regression shows that TDSC ( $\beta=.273$ ,  $p=.002$ ) and TDST ( $\beta=.188$ ,  $p=.025$ ) are significant predictors of satisfaction. TDSS does not significantly predict satisfaction ( $\beta=.155$ ,  $p=.07$ ). Together, they account for a total of  $R^2=.213$ ,  $F(3, 136) = 13.54$  ( $p<.001$ ). This is a notable difference from Paul et al. (2015), in which all TD sub-constructs were significant predictors. In addition, in this study TDSC is the strongest predictor instead of TDST being the strongest predictor in Paul et al. (2015). Also, the predictive capabilities of the sub-constructs amount to a much lower  $R^2$  in the present study, compared to Paul et al. (2015), in which  $R^2=.586$ . H2 is partly supported with only TDSC and TDST being significant predictors.

Table 3

#### Model Summary

Model	R	R <sup>2</sup>	Adjusted R <sup>2</sup>	RMSE
1	0.480	0.230	0.213	0.643

Table 4

#### Regression Coefficients

Model		B	SE	$\beta$	t	p
1	intercept	1.340	0.357		3.751	< .001
	TDSC	0.299	0.097	0.273	3.082	0.002
	TDSS	0.123	0.068	0.155	1.826	0.070
	TDST	0.177	0.078	0.188	2.268	0.025

### RQ3

To answer RQ3, different analyses were conducted to assess validity and reliability of the new TDSTECH scale. Principal Component Analysis (PCA), with Eigenvalue 1, oblique rotation shows a four component solution (Appendix A). The items were developed with four components in mind; learner readiness for using technology, effectiveness, efficiency, and satisfaction, as explained in Chapter 4. Apparently, respondents were able to differentiate between the four components. However, as Appendix A shows, one item (Usab9) loads on satisfaction instead of efficiency, suggesting this item was not interpreted as intended. Therefore, it will be excluded from the scale. All in all, it seems that

the component structure supports the validity of the items in representing the TDSTECH construct and its sub-dimensions.

Reliability as assessed via Cronbach's Alpha was found to be excellent,  $\alpha=0.873$ . In terms of convergent validity, TDSTECH is expected to correlate highly with the old (Zhang, 2003) Student-Interface TD scale, and moderately with all other TDs. This was supported (Appendix C). In terms of discriminant validity, the four TDSTECH components should load differently than TDSS, TDST, and TDSC. This was supported, as PCA with Eigenvalue 1, oblique rotation shows a seven component solution (Appendix B). This suggests that all scales do indeed measure different, albeit correlated constructs.

#### RQ 4

In a first attempt to assess the relationship of TDSTECH with the other sub-constructs, as well as satisfaction with the learning experience, TDSTECH is introduced to the regression model. Zero order correlations between all variables are highly significant ( $p<.001$ ) and range from  $r=.29$  to  $r=.54$  (Table 5).

Table 5

#### *Pearson Correlations*

	Satisfaction	TDST	TDSC	TDSS	TDSTECH
Satisfaction	—	0.34 ***	0.41 ***	0.30 ***	0.54 ***
TDST		—	0.40 ***	0.29 ***	0.51 ***
TDSC			—	0.45 ***	0.38 ***
TDSS				—	0.32 ***
TDSTECH					—

\*\*\*  $p < .001$

Results of regression analysis show that TDSTECH is a much stronger predictor than the other sub-constructs. In fact, it leaves only TDSC as a significant predictor: TDSTECH ( $\beta=.411$ ,  $p<.001$ ), TDSC ( $\beta=.208$ ,  $p<.05$ ), TDSS ( $\beta=.097$ ,  $p>.05$ ), and TDST ( $\beta=.019$ ,  $p>.05$ ). Because all sub-constructs are correlated and TDSTECH has such a strong impact on the model, multicollinearity might be considered an issue. However, Variance Inflation Factor (VIF) do not suggest so, as they are well below any rule of thumb, for example, 4 or 10 (Table 7; O'Brien, 2007).

Table 6

#### *Model Summary*

Model	R	R <sup>2</sup>	Adjusted R <sup>2</sup>	RMSE
1	0.587	0.345	0.326	0.595

Table 7

Regression Coefficients

Model	B	SE	$\beta$	t	p	Collinearity statistics	
						Tolerance	VIF
1 intercept	0.754	0.352		2.144	0.034		
TDSC	0.228	0.091	0.208	2.503	0.013	0.701	1.426
TDSS	0.077	0.063	0.097	1.219	0.225	0.766	1.305
TDST	0.018	0.079	0.019	0.230	0.818	0.686	1.457
TDSTECH	0.442	0.091	0.411	4.872	< .001	0.681	1.467

Because the introduction of TDSTECH into the model substantially decreases the beta of TDSS, TDST, and to a smaller amount that of TDSC, an indirect effect is expected here. This was also implicitly suggested in the original conception of TD student-interface by Hillman et al. (1994). Therefore, a model with TDSTECH as mediator will be tested. Classical Tests of mediation are the Baron and Kenny (1986) procedure and Sobel test (Sobel, 1986). Because these methods have been associated with shortcomings (Hayes & Scharkow 2013; Shrout & Bolger, 2002), a bias corrected bootstrapping procedure was used instead. The PROCESS macro for IBM SPSS is a tool for path analysis-based moderation and mediation, as well as conditional process models (e.g., moderated mediation and mediated moderation) (Hayes, 2013). In the present study, there are three independent variables to be assessed regarding mediation. This raises the question if they should be analyzed separately or simultaneously. Running it separately for each independent variable without controlling for the others is expected to result in larger effects. However, because the predictor variables are correlated, the results may be confounded, as the effects wouldn't be unique to the predictor variable, but instead shared by its correlates. The effect sizes would then be misleading. Therefore, all independent variables were simultaneously included in the mediation model. Because PROCESS has no preset models for this case, the model was run three times, once with each TD, TDSTECH as mediator, and the remaining two TD's as covariates. This approach yields the same results as if the model had been estimated simultaneously (Hayes, 2013). Table 8 shows the estimated indirect effects and effect sizes in  $K^2$ . The analysis yields a non-significant indirect effect for TDSS on Satisfaction through TDSTECH,  $b=.046$ , Bca CI [-.004, .112] with  $K^2 =.058$ , a significant indirect effect for TDST on Satisfaction through TDSTECH,  $b=.159$ , Bca CI [.92, .253] with  $K^2 =.171$ , and a non-significant indirect effect for TDSC on Satisfaction through TDSTECH,  $b=.071$ , Bca CI [.02, .184] with  $K^2 =.061$ .

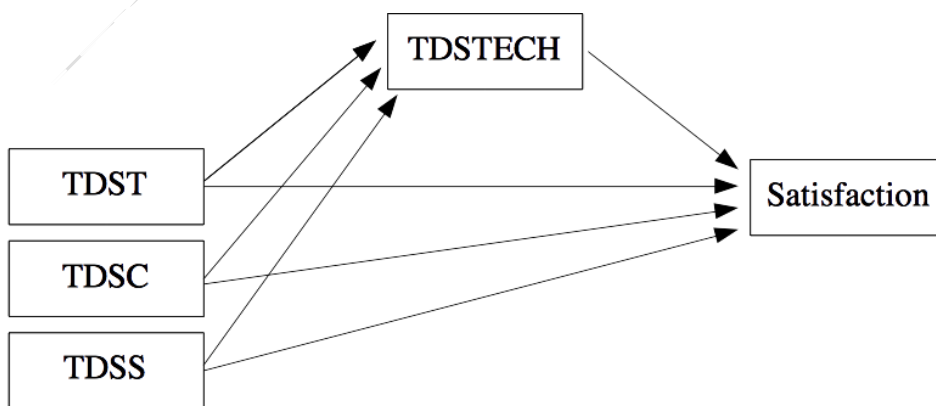


Figure 1. Conceptual mediation model to be tested.

Table 8

Summary of Three Mediation Models With Covariates

	Mediator	Covariates	Indirect effect [95% CI's]	Bootstr. SE	Effect size $K^2$ [95% CI's]	Bootstr. SE
TDST on Satisfaction	TDSTECH	TDSC, TDSS	<b>.159</b> [.092, .253]	.041	<b>.171</b> [.104, .265]	.039
TDSC on Satisfaction	TDSTECH	TDSS, TDST	<b>.071</b> [.002, .184]	.044	<b>.061</b> [.002, .161]	.036
TDSS on Satisfaction	TDSTECH	TDSC, TDST	<b>.046</b> [-.004, .112]	.029	<b>.058</b> [-.004, .136]	.035

Table 9

Summary of Path Coefficients

Path	Coefficient
TDST→TDSTECH	.359 [.224, .494] <sup>***</sup>
TDST→Satisfaction	.018 [-.138, .175]
TDSC→TDSTECH	.161 [-.007, .329]
TDSC→Satisfaction	.228 [.048, .408] <sup>*</sup>
TDSS→TDSTECH	.105 [-.012, .222]
TDSS→Satisfaction	.077 [-.048, .202]
TDSTECH→Satisfaction	.442 [.263, .621] <sup>***</sup>

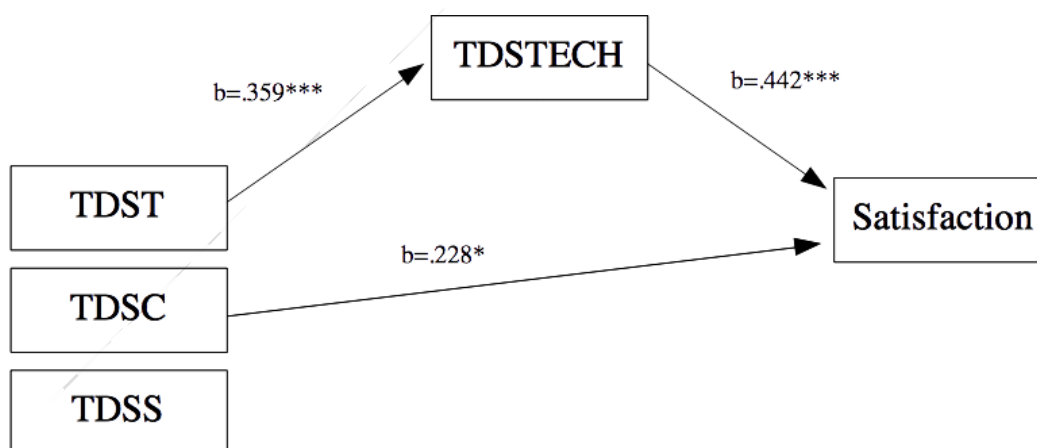


Figure 2. Mediation Model based on path coefficients.

## Interpretation

The regression model of TDST, TDSC, TDSS, and satisfaction shows that only TDSC and TDST are significant predictors. This is interesting, because other lines of research have consistently shown the importance of certain social aspect for online learning (Richardson, Caskurlu, & Maeda, 2017). In the

present student population, it seems that being able to meaningfully engage with the learning content and to feel a certain psychological closeness to the instructor are essential for a satisfying experience, the psychological closeness to ones' peers is not.

In line with previous research along these lines, results show that TDSTECH is indeed an important predictor for satisfaction. This is not surprising when considering that TDSTECH underlies all interaction within an online distance learning context. Effectively, there is no interaction with peers, content, or instructors without the antecedent of interacting with the technology itself. Accordingly, the perceptions of transactional distance will be strongly influenced by the views, attitudes, and experiences a student may have with the mediating technology. We suggest that this psychological distance may underlie all possible ways of interaction for online and distance learners and therefore is essential in understanding their experience. This notion is supported by the regression model, in which TDSTECH is by far the strongest predictor for satisfaction, so much so that its introduction to the model leaves only TDSC and TDSTECH as significant predictors.

The mediation model, however, suggests that only TDST is significantly mediated by TDSTECH. This can be taken to mean that the influence of the perceived distance between student and instructor on satisfaction with the learning experience is influenced by TDSTECH in a way that no direct effect of TDST on satisfaction remains. An explanation for this may be that students primarily engage with instructors via technology that is unique to their distance education provider. In this population, students usually contact their instructors via Moodle or the university's own e-mail system. In these forms of communication, student's computer efficacy and the technology's usability may indeed be relevant to understand the perceived distance between students and teachers, as well as the relationship to satisfaction. Past research has shown that the presence of teaching faculty is an important part of the learning experience. Some studies have identified it as the most important aspect, as per student opinion (e.g., Maddrell, Morrison, & Watson, 2017). This study suggests, however, that there may be barriers regarding the psychological distance of students and teachers. The technology of the learning environment, as well as the student's proficiency in handling this technology may cause barriers in engagement with faculty. Because students rely on teachers for support, reducing transaction distance is critical.

On the other hand, TDSC has a direct effect on satisfaction without a mediating influence of TDSTECH. This is interesting because it suggests that the relationship of student-content interaction with satisfaction is not reliant on perceptions of the technology. It seems that the ability to meaningfully engage with the learning content is associated with satisfaction, no matter the technology involved. Again, this may be explained by characteristics of the population, as determined by the university's instructional methods. Much of the primarily important content is still delivered via print material. Although there is supplemental material in Moodle, most of the relevant content is still accessed offline. Because engaging with print material is not determined by perceptions of one's own computer proficiency and the technologies usability, TDSTECH has no significant role here. To the extent that other distance online learning providers deliver their main content via technology, this direct effect may disappear and a mediating effect of TDSTECH may emerge.

Since TDSS was not a significant predictor for satisfaction in the regression model, there was also no direct or indirect effect in the mediation model. Here, the psychological distance to one's peers does not seem to impact the satisfaction with the learning experience. This is surprising as it doesn't conform with research on social aspects of online learning.

## Conclusion and Limitations

This study has demonstrated the importance of TDSTECH in understanding how satisfying online and distance learning experiences come to be. Although TDSTECH is partly determined by individual student characteristics that cannot be readily manipulated, choosing delivery and communication technology according to its usability is possible. Results of this study suggest that this decision may be more critical for improving satisfaction than previously thought. Statistical analyses of student responses show the importance of effective, efficient, and satisfying learning technology in order to foster TDSTECH, which in turn mediates TDST and is highly relevant for student satisfaction. Online and distance education providers may be advised to pilot-test learning technology and use the TDSTECH scale to assess the adequacy of the technology in relation to student's computer proficiency.

Although we proposed an updated TDSTECH scale with good predictive capabilities in terms of satisfaction, we have no data regarding the relevance of TDSTECH for actual student learning. It has been notoriously difficult to find consistent evidence for relationships between affective aspects like psychological distance and actual cognitive learning gains in terms of achievement measures. For example, even though Hostetter and Bush (2012) and Joksimović, Gašević, Kovanović, Riecke, and Hatala (2015) found some evidence of relationships between social presence indicators and test scores via content analysis, the evidence base is still shaky. Not only because these studies are correlational and the relationships susceptible to confounding variables, but even more importantly, there is still no substantive theory linking these affective variables to cognitive learning. Because of these shortcomings in the literature, cognitive learning gains can't be reliably predicted via affective aspects like psychological distance. However, because they indeed have empirically supported predictive capabilities in regards to satisfaction, which in turn is associated with retention and persistence, understanding these variables may be the most promising course of action for the time being.

One major limitation is a methodological one. The TDSTECH scale was not validated on a separate data set. Instead, validation and inference were conducted on one sample. Therefore, caution in interpreting the results is advised. TDSTECH, as well as its relationship to other relevant variables should be tested in different settings and possibly with a larger N. It may be interesting to find out if TDSTECH is equally relevant in different settings and how this may influence mediation patterns.



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## Appendix A

### Component Loadings of TDSTECH Items

	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>Uniqueness</b>
SI_PC_readin1	.	.	0.911	.	0.266
SI_PC_readin2	.	.	0.896	.	0.227
SI_PC_readin3	.	.	0.588	.	0.267
SI_Usab4	.	0.860	.	.	0.163
SI_Usab5	.	0.933	.	.	0.140
SI_Usab6	.	0.908	.	.	0.202
SI_Usab7	.	.	.	0.916	0.159
SI_Usab8	.	.	.	0.939	0.159
*SI_Usab9	0.757	.	.	.	0.445
SI_Usab10	0.926	.	.	.	0.140
SI_Usab11	0.936	.	.	.	0.130
SI_Usab12	0.936	.	.	.	0.136

\* item excluded from further analyses

## Appendix B

### Component Loadings of all TD Items

	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>Uniqueness</b>
TDSC_1	.	.	.	.	.	.	0.727	0.321
TDSC_2	.	.	.	.	.	.	0.954	0.279
TDSC_3	.	.	.	.	.	.	0.638	0.412
SI_PC_readin1	.	.	.	.	0.908	.	.	0.264
SI_PC_readin2	.	.	.	.	0.857	.	.	0.226
SI_PC_readin3	.	.	.	.	0.599	.	.	0.234
SI_Usab4	.	.	.	0.830	.	.	.	0.156
SI_Usab5	.	.	.	0.939	.	.	.	0.124
SI_Usab6	.	.	.	0.810	.	.	.	0.208
SI_Usab7	.	.	.	.	.	0.877	.	0.147
SI_Usab8	.	.	.	.	.	0.751	.	0.319
SI_Usab9	.	0.897	.	.	.	.	.	0.120
SI_Usab10	.	0.898	.	.	.	.	.	0.105
SI_Usab11	.	0.894	.	.	.	.	.	0.113
TDSS_1	0.919	.	.	.	.	.	.	0.179
TDSS_2	0.909	.	.	.	.	.	.	0.170
TDSS_3	0.900	.	.	.	.	.	.	0.169
TDSS_4	0.945	.	.	.	.	.	.	0.101
TDSS_5	0.636	.	.	.	.	.	.	0.353
TDST_1	.	.	.	.	.	0.814	.	0.312
TDST_2	.	.	0.783	.	.	.	.	0.301
TDST_3	.	.	0.885	.	.	.	.	0.115
TDST_4	.	.	0.882	.	.	.	.	0.177

## Appendix C

### Pearson Correlations

	SI_old	TDSTECH	TDSC	TDSS	TDST
SI_old	—	0.784 ***	0.453 ***	0.354 ***	0.489 ***
TDSTECH		—	0.382 ***	0.316 ***	0.514 ***
TDSC			—	0.449 ***	0.399 ***
TDSS				—	0.290 ***
TDST					—

\*\*\* p < .001

## Appendix D

### Scales Used in This Study

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<i>TDSC</i>	= <i>Transactional distance between students and content</i>
1	This course emphasized SYNTHESIZING and organizing ideas, information, or experiences.
2	This course emphasized MAKING JUDGEMENTS about the value of information, arguments, or methods.
3	This course emphasized APPLYING theories and concepts to practical problems or in new situations.

<i>TDSS</i>	= <i>Transactional distance between students</i>
1	I get along well with my classmates
2	I feel valued by the class members in this online class
3	My classmates in this online class value my ideas and opinions very highly
4	My classmates respect me in this online class
5	The class members are supportive of my ability to make my own decisions

<i>TDST</i>	= <i>Transactional distance between students and teacher</i>
1	The instructor pays no attention to me*
2	I receive prompt feedback from the instructor on my academic performance
3	The instructor was helpful to me
4	The instructor can be turned to when I need help in the course

<i>TDSTECH</i>	= <i>Transactional distance between student and technology</i>
1	I feel confident in using office-programs like Word and Excel
2	I feel competent in researching information and finding resources on the internet
3	I feel confident in using the online learning environment Moodle
4	Moodle was helpful in supporting my learning activities
5	Moodle was helpful in reaching my learning goals
6	I feel that Moodle supported my learning
7	I experienced frustration using Moodle*
8	I had to consciously think about how to use Moodle*
9	I feel comfortable using Moodle
10	I feel satisfied using Moodle
11	I find it pleasant to use Moodle

<i>Satisfaction with the learning experience</i>	
1	I benefited from this course
2	This course met my expectations
3	I experienced and learned new things in this course
4	The content covered in this course was not interesting*
5	I would like to take more courses like this one
6	I wish other course were more like this one

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\*reverse coded items





July – 2018

# Social Media Adoption by the Academic Community: Theoretical Insights and Empirical Evidence From Developing Countries

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## Abstract

The paper investigates the impact of virtual environmental characteristics such as collaboration, communication, and resource sharing on social media adoption by the academic community at the university level. Building on the social constructivist paradigm and technology acceptance model, we propose a conceptual model to assess social media adoption in academia by incorporating collaboration, communication, and resource sharing as predictors of social media adoption, whereas perceived ease of use and perceived usefulness act as mediators in this relationship. Structural equation modeling serves to estimate the proposed conceptual model on a sample of 661 respondents from the Kingdom of Saudi Arabia and Pakistan. The findings suggest that an individual's propensity toward social media features (i.e., collaboration, communication, and resource sharing) acts as a stimulus to their social media adoption. Moreover, perceived ease of use and perceived usefulness mediate the relationship between these stimuli and their outcomes (i.e., social media adoption). The paper concludes with the discussion on the findings and recommendations for the academicians and the practitioners of social media in the higher education institutions.

*Keywords:* collaboration, communication, resource sharing, social media, academia

## Introduction

Due to easy access to the internet, the use of social media has massively increased in recent years (Karikari, Kofi, & Owusu-Frimpong, 2017). The internet usage has exponentially grown in the past decade, and more than half of world population have access to the internet (Internet World Stats, 2018). Majority of the internet users are also regular users of social media platforms such as Facebook, Twitter, LinkedIn, and YouTube. In the past decade, these social media platforms have become extremely popular mainly due to the content sharing capability of Web 2.0 technology. According to the latest social media statistics, there are more than 2 billion Facebook users, more than 300 million Twitter users, more than 500 million Google+ users, and more than 400 million LinkedIn users (InternetLiveStats, 2018). Above statistics show an emerging trend of social media usage around the globe. Although social media platforms were initially created for the social communication and social interaction, over time academics have realized the advantages of these tools over the traditional communication tools (e.g., university email) in their professional activities, due to certain features such as ease of use and usefulness for collaboration and communication (Berger, 2017; Forbes, 2017; Tess, 2013). However, although social media is rapidly penetrating into the society, there is no consensus in the literature on the drivers of social media adoption in an academic context. Moreover, it is not clear how social media can impact academic performance. While there are studies showing the effective role of social media in academic performance at higher education (Sobaih, Moustafa, Ghandforoush, & Khan, 2016), some argue that there is no significant relationship between social media usage and academic performance (Lau, 2017). Therefore, there is a need to further investigate underlying motives behind social media adoption by the academic community (e.g., students, researchers, and faculty). This study is an attempt to explore the motivators behind an individuals' social media adoption in academic institutions at the university level.

Generally, the social media users are those individuals who wish to interact and collaborate with other members through the virtual community (Hrastinski & Aghaee, 2012). Despite this fact, underlying motives of social media usage for educational purposes is relatively less explored (Hrastinski & Aghaee, 2012). Moreover, the previous discussions are ambiguous in suggesting the key determinants of social media, i.e., the elements which narrate into learning, knowledge, and education (Selwyn, 2012). Though there is evidence of research on topics focusing on social media adoption from various perspectives (Hopp & Gangadharbatla, 2016; Kwahk & Park, 2016; Maresh-Fuehrer & Smith, 2016; Zolkepli & Kamarulzaman, 2015), the research on social media adoption in the context of higher education is still limited (Forkosh-Baruch & HersHKovitz, 2012). Therefore, considering academic community among the main users of social media for sharing their explicit and tacit knowledge (Chen & Bryer, 2012; Tess, 2013), this study aims to explore the stimuli that provoke social media adoption by the academic community. The study hence strives to develop and validate the adoption of social media, by the academic community, through integrating important motivational determinants of social media.

An efficient application of modern social technology with social media tools can be in developing collaborative learning environment based on the social constructivist paradigm. Social media platforms have significant capability to support the social constructivist paradigm that promotes collaborative learning (Vygotsky, 1978). Web 2.0 technologies pave the way to social and collaborative learning by facilitating communication, collaboration, and resource sharing in an easy and interesting manner through

social media platforms (Mbat, 2013). Therefore, building on the social constructivist paradigm (Vygotsky, 1978) and technology acceptance model (Davis, 1989), this research aims to investigate the role of social and technological factors leading to social media adoption by the academic community. Specifically, we want to investigate how collaboration, communication and resource sharing capabilities of social media platforms may stimulate the individuals' social media adoption and how users' technology-related beliefs (i.e., perceived ease of use and usefulness) of social media may intervene the relationship between this stimulus and social media adoption in an academic context.

Drawing on the technology acceptance model (Davis, 1989) and social constructivist paradigm (Vygotsky, 1978), the study contributes to literature (1) by proposing a Social Media Adoption Model (SMAM) for the academic community, and (2) by empirically validating this model with data from Kingdom of Saudi Arabia (KSA) and Pakistan. In this model, collaboration, communication, and resource sharing have been identified as the stimuli to social media adoption; whereas, perceived usefulness and perceived ease of use have emerged as the mediators. Additionally, past social media experience with social media platforms is found to have a significant effect on academicians' social media adoption.

The paper is organized as follows. First, the theoretical background is discussed followed by hypotheses development for each construct. Next, research methodology, measures, and procedure are explained. Then, data analysis and results are presented. Finally, the article concludes by a discussion on the results, followed by its limitations and potential future directions.

## Theoretical Background

In the past decade, social media platforms have significantly changed the ways of communication and collaboration in the society. Such web-based technologies are being accepted worldwide and their usage has also emerged in the higher education sector providing the bulk of information through technological innovation (Wankel, 2009). Social media platforms provide an easy alternative, to the academic community, as compared to official communications such as email and blackboard. Thus, it is emerging as a new communication and collaboration tool among the academic community in higher education institutions (Roblyer, McDaniel, Webb, Herman, & Witty, 2010). Social media has greatly changed the communication/feedback environment by introducing technologies that have modified the educational perspective of learning and interacting (Prensky, 2001).

Literature provides evidence of social media usage as an essential learning component for academic communities in higher education (Chen & Gilchrist, 2013). Social media has facilitated not only students but also researchers and educators by providing them with a platform to collaborate and communicate. Currently, social media platforms are being effectively used by the academic community in a variety of ways, such as through blogs and sharing of educational videos, updates, and academic documents (Berger, 2017). There is no doubt in the critical role that faculty play in facilitating and guiding their students; social media can facilitate this student-teacher relationship and hence, enhance the overall learning experience (Sobaih et al., 2016; Tess, 2013) . Faculty might attempt to strengthen their students' learning experience by integrating online networks support and interesting features such as informal learning (Mazman & Usuel,

2010; Sánchez, Cortijo, & Javed, 2014). Forkosh-Baruch and Hershkovitz (2012) have suggested that social networking sites promote knowledge/information sharing through providing a collaborative platform for the academic institutions. Literature suggests that despite the excessive research on higher education and its link to social media and its various tools, the gap regarding the drivers which promote an individual to adopt social media still requires further research (Hu & Hui, 2012). This research is an attempt to address these issues.

## Hypotheses Development

Historically, the Theory of Reasoned Action (Fishbein & Ajzen, 1975) and the Technology Acceptance Model (Davis, 1989) have been used to assess individuals' acceptance and use of technology. According to the Technology Acceptance Model, perceived usefulness and perceived ease are the main determinants of an individual's behavioral intentions and actual usage (Davis, 1989). The following section reflects how perceived usefulness, perceived ease of use, collaboration, communication, and resource sharing are related to social media adoption.

### Perceived Usefulness

Perceived usefulness, derived from the Technology Acceptance Model (TAM), is the particular level that an individual perceives that they can improve their job performance or create ease in attaining the targeted goals by using an information system. It is also believed to make an individual free from mental pressure (Davis, 1989). Consistently, perceived usefulness has been considered as a strong predictor for the adoption of technology (Jiang, Hsu, Klein, & Lin, 2000). The literature supports that TAM helps in assessing and predicting the use of technology in academia (Lu, Yao, & Yu, 2005). Therefore, we encompass perceived usefulness of the social media as a substantial predictor of social media adoption in education. As such, we hypothesize:

Hypothesis 1: Perceived usefulness of social media positively affects social media adoption.

### Perceived Ease of Use

Perceived ease of use can be defined as the level to which an individual believes that using a specific system will make a task easier (Gruzd, Staves, & Wilk, 2012) and will reduce mental exertion (Davis, 1989). Venkatesh (2000) posits this construct as a vital element in determining a user's behavior toward technology. Though generally, there is consensus on the positive effect of perceived ease of use and perceived usefulness on users' attitude towards social media, it is not yet clear which one of these is more relevant in explaining users' attitude towards social media in the academic community (Lowry, 2002). Perceived ease of use is one of the eminent behavioral beliefs affecting the users' intention toward technology acceptance (Lu et al., 2005). The literature suggests that perceived ease of use of technology develops a positive attitude toward its usage (Davis, 1989). Therefore, we posit that a users' perception of the ease of use of social media will play an important role in forming their positive attitude toward social media and will eventually result in social media adoption. Hence, we hypothesize:

Hypothesis 2a: Perceived ease of use of social media positively affects social media adoption.

Hypothesis 2b: Perceived ease of use of social media positively affects its perceived usefulness.

## **Collaboration**

Social media platforms have thoroughly transformed the ways of communications by offering collaborative and shared learning experiences. The beneficiaries are not only the general public but also the academic community (Kaplan & Haenlein, 2010). Collaborative learning is considered as an essential instructional method as it assists in overcoming the communication gap among the academic community (Bernard, Rubalcava, & St-Pierre, 2000). The academic community utilizes various social media platforms with the intention to socialize and communicate with others and to share common interests (Sánchez et al., 2014; Sobaih et al., 2016). The exchange of information through social media platforms help the academic community to develop an easy and effective communication among classmates and colleagues (Kaplan & Haenlein, 2010). Social media platforms can also help in developing communities of practice that may help improve collaboration and communication among members of the community (Sánchez et al., 2014). Evidence from previous work confirms that social media platforms are beneficial to college and university students for education purposes (Forkosh-Baruch & Hershkovitz, 2012). Due to the intrinsic ease of use and usefulness of social media, academics are regularly using information and communication technologies, especially social media, for collaboration with colleagues in one way or the other (Koh & Lim, 2012; Wang, 2010). On the basis of above justification, the following hypotheses have been formulated:

Hypothesis 3a: Perceived usefulness mediates the relationship between collaboration and social media adoption.

Hypothesis 3b: Perceived ease of use mediates the relationship between collaboration and social media adoption.

## **Communication**

Social Media offers a platform to communicate via sending and receiving messages, which can also be used by the academic community to exchange information and knowledge (Kaplan & Haenlein, 2010). Various researchers have proposed the adoption of social media as a way of communication for the academic community. Among these, Wankel (2009) and Gruzd et al. (2012) proposed that social media can promote healthy communication for learners through social media tools and apps, hence providing the academic community with new means of learning and knowledge creation. Faculty can use social media to communicate with their students effectively; teachers can create discussion groups where students can share their thoughts and questions with their classmates and seek guidance from their teacher. Unlike official communication channels such as email, these days, people are more active on social media which can also help the academic community quickly disseminate any important information. For the academic community, this mode of communication seems promising because it helps them to collaborate and engage with the community members. We argue that the users' perceived ease of use and usefulness of social media will positively influence their social media adoption and will also strengthen the relationship between communication and social media adoption. Hence, our hypotheses are:

Hypothesis 4a: Perceived usefulness mediates the relationship between communication and social media adoption.

Hypothesis 4b: Perceived ease of use mediates the relationship between communication and social media adoption.

## Resource Sharing

Resource sharing refers to an individual's agreement to sharing their resources, such as ideas and academic material with others through social media platforms (Bock, Zmud, Kim, & Lee, 2005). Social media platforms allow for the sharing and dissemination of user-generated content and resources (Kaplan & Haenlein, 2010), as a medium that facilitates knowledge seekers and knowledge providers in learning and teaching by providing them a collaborative environment (Selwyn, 2012). The literature suggests that social media promotes knowledge/information sharing through providing collaborative platforms for dissemination of online learning resources (Forkosh-Baruch & Hershkovitz, 2012). It alludes to the point that activities through social networks and social media tools facilitate resource sharing; as learners perceive this medium to be easy to use and useful because it helps them share their knowledge and resources to the relevant person more effectively and efficiently (Mazer, Murphy, & Simonds, 2007). We posit that:

Hypothesis 5a: Perceived usefulness mediates the relationship between resource sharing and social media adoption.

Hypothesis 5b: Perceived ease of use mediates the relationship between resource sharing and social media adoption.

## Covariates

We incorporated individuals' demographics such as age, gender, and social media experience as covariates because these variables are known to impact the individuals' social media adoption.

The proposed Social Media Adoption Model (Figure 1) summarizes the relationships among the proposed stimuli of social media usage (i.e., collaboration, communication and resource sharing) their outcome (social media adoption) and the proposed mediators (perceived usefulness and perceived ease of use) along with the control variable (age, gender, social media experience).

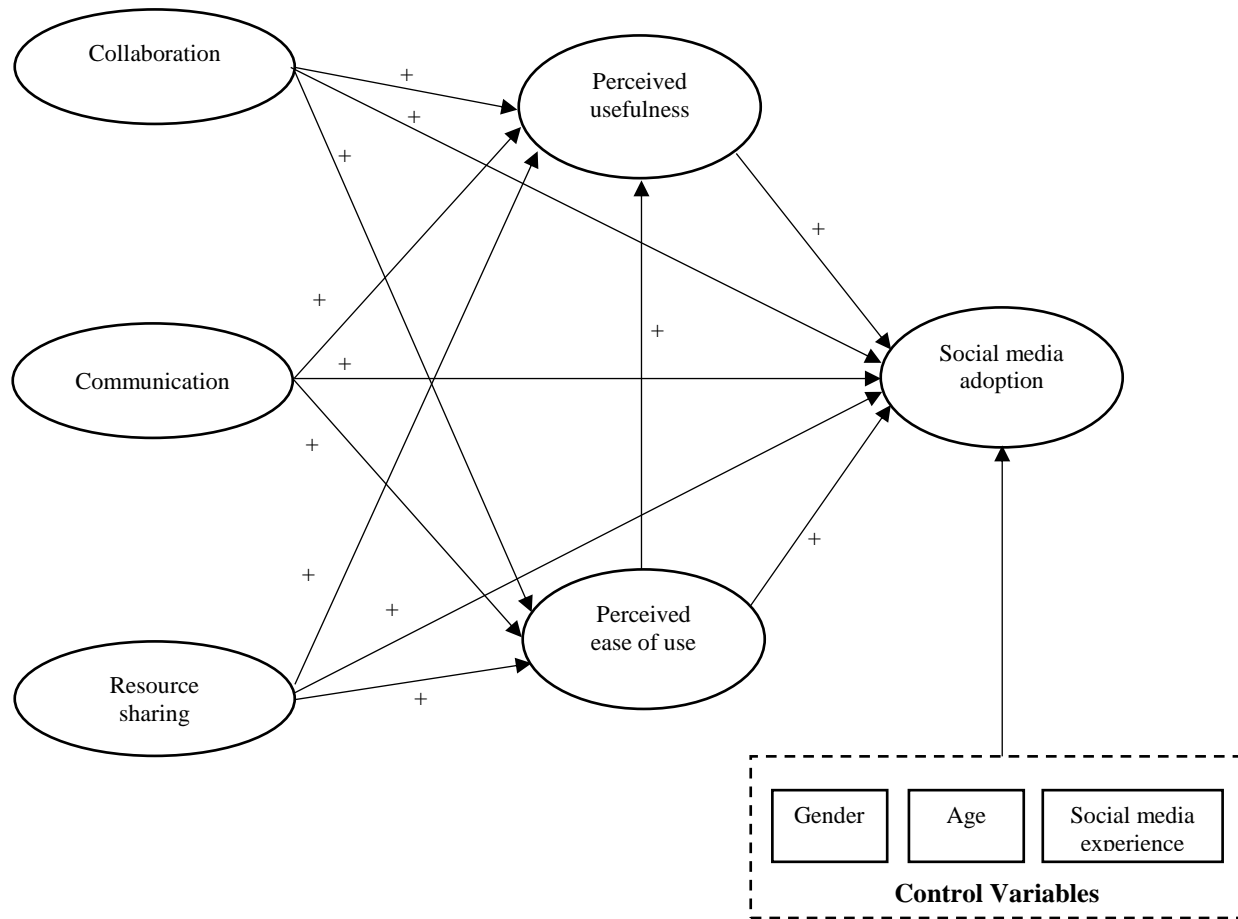


Figure 1. Social Media Adoption Model (SMAM).

## Methodology

### Measures and Procedure

All the items to measure latent variables have been designed on the basis of technology acceptance literature and are adapted in the context of social media adoption by the academic community. Each construct, in this study, has been measured by four items each anchored on a 5-point Likert scale (1= Strongly Disagree to 5= Strongly Agree). The final items in the questionnaire are presented in Appendix A.

Data was gathered from the academic community with special emphasis on higher education institutions in KSA and Pakistan. Before the final data collection, a pretest was conducted with 50 participants in both countries to assess the reliability and validity of the constructs. The results of the pretest indicated adequate reliability of the scales as the Cronbach's alpha values for each scale were above 0.70 (Gerbing & Anderson, 1988). Following convenience sampling approach, respondents of both countries were approached in large

universities at various places within the university campuses such as classrooms, coffees shops, and faculty offices.

### Sample Demographics

A total of 661 responses were collected (326 from Pakistan and 335 from KSA) for the empirical testing of the conceptual model. The respondents' ages range from 17 to 40 years in both countries. The Pakistani sample comprises of 51% females and 49% males; whereas, the Saudi sample consists of 43.6% females and 56.4% males. The majority of respondents (82%) logged into social media websites daily. In the Pakistani sample, only 3.1% of the respondents were undergraduates; 53.6% were graduates, and 43.3% were postgraduates while in the Saudi sample 61.2% of the respondents were undergraduates, 28.1% were graduates, and 10.7% were postgraduates. The subjects report that they utilize social media in their studies, research and academic career, and 5.2% reported that they never used social media for academic purposes as they believe that social media is for the personal use and not for education-related activities. Concerning the social media usage experience: in the Pakistani sample, 27.3% identified as expert users, 46% as intermediate users, and 26.7% as beginners; whereas, in the Saudi sample 29.6% identified as expert users 48.1% as intermediate users, and 22.4% as beginners. In both countries, the most preferred social media platform for educational purposes include Facebook, LinkedIn, YouTube, and Twitter.

## Data Analysis

The data analysis is carried out in two phases. The psychometric properties (i.e., reliability and validity) of the adapted measures were examined in the first phase using confirmatory factor analysis (CFA), while the proposed relationships among latent variables were tested through the structural model in the second phase. Multiple measures such as normed chi-square ( $\chi^2$ ), Goodness of Fit Index (GFI), Adjusted Goodness of Fit Index (AGFI), Comparative Fit Index (CFI), Tucker-Lewis Index (TLI), and Root Mean Square Error of Approximation (RMSEA) were used to analyze the model fit (Hu & Bentler, 1999).

### Confirmatory Factor Analysis

We estimate psychometric properties of the adapted measures by multi-group confirmatory factor analysis (CFA) using AMOS 23. The fit indices of the measurement model ( $\chi^2 = 900.97$ ,  $df = 474$ ,  $\chi^2 / df = 1.90$ ,  $GFI = 0.89$ ,  $AGFI = 0.87$ ,  $CFI = 0.96$ ,  $TLI = 0.95$ ,  $RMSEA = 0.04$ ) illustrate an adequate fit. The reliability and validity of the scales were assessed through results of the measurement model. Composite reliability (CR) along with Cronbach's alpha values were assessed to examine the reliability of the scale. Both the composite reliability and Cronbach's alpha values were above 0.8, indicating strong internal reliability and consistency of each adapted measure (see Table 1).

Following Fornell and Larcker (1981), the convergent and discriminant validity was established. The results in Table 1 show that the average variance extracted (AVE) values (diagonal entries) for each construct are greater than 0.5 for both the countries and are also greater than shared variances (off-diagonal entries).



## Common Method Variance (CMV)

We used Harman's single factor test and common latent factor method to verify the presence of any CMV. The variance explained by an un-rotated single factor is 36%, i.e., it remains within the acceptable limit of 50% for the absence of CMV (Podsakoff, MacKenzie, Lee, & Podsakoff, 2003). The fit indices ( $\chi^2=2372.72$ ,  $df = 252$ ,  $\chi^2/df=9.41$ ,  $GFI = 0.72$ ,  $AGFI= 0.67$ ,  $CFI=0.79$ ,  $TLI=0.77$ ,  $RMSEA=0.12$ ) of the single latent factor model reveal a poor model fit, suggesting no threat of CMV.

Table 1

### Convergent and Discriminant Validity

CR	Constructs	COL	COM	RS	PU	PEU	KSI
0.88(0.85)	Collaboration (COL) Communication	0.65(0.6)	0.54	0.36	0.50	0.44	0.55
0.83(0.86)	(COM)	0.26	0.54(0.6)	0.44	0.57	0.51	0.60
0.81(0.84)	Resource Sharing (RS) Perceived Usefulness	0.28	0.51	0.52(0.57)	0.44	0.36	0.54
0.86(0.89)	(PU) Perceived Ease of Use	0.30	0.36	0.34	0.61(0.67)	0.56	0.65
0.82(0.89)	(PEU) Social media adoption	0.39	0.51	0.43	0.40	0.54(0.66)	0.58
0.89(0.90)	(SMA)	0.41	0.50	0.48	0.50	0.54	0.66(0.7)

Note. CR: Composite reliability, Diagonal elements are Average variance extracted and below (above) the diagonal are shared variances for Pakistan (KSA) data. The values in the parentheses are for KSA.

## Structural Regression Model

The structural equation modeling (SEM) technique, a multi-group structural regression model, was employed through AMOS 23 to measure the proposed relationships of the conceptual model. The model shows a good fit as depicted by the fit indices ( $\chi^2 = 1365.16$ ,  $df = 537$ ,  $\chi^2 / df = 2.54$ ,  $GFI = 0.84$ ,  $AGFI = 0.89$ ,  $CFI = 0.92$ ,  $TLI = .91$ ,  $RMSEA = .04$ ). Overall, the adequacy of model fit allows us to further analyze our hypotheses.

## Direct Effects

Table 2 presents the structural model results of the direct effects, for both the countries. H1 and H2a posit the positive impact of perceived usefulness (PU) and perceived ease of use (PEU) of social media on social media adoption (SMA). The results indicate that, in both countries, PU ( $\beta=.25$ ,  $p<.01$ ;  $\beta=.34$ ,  $p<.001$ ) and PEU ( $\beta=.23$ ,  $p<.01$ ;  $\beta=.25$ ,  $p<.01$ ) of social media have a significant positive effect on SMA. The results suggest that PU is slightly higher in KSA than in Pakistan, while, PEU is almost the same for both samples; hence, providing support for H1 and H2a. H2b also finds support, in both samples, for the positive association between the PEU and PU ( $\beta=.40$ ,  $p<.001$ ;  $\beta=.24$ ,  $p<.01$ ). The collaboration (COL), communication (COM) and resource sharing (RS) have a significant positive effect on PU and PEU. Moreover, the direct effects of COL and RS on social media adoption are also found to be positive and

significant for both samples. However, the impact of COM on SMA is significant for the KSA sample but not for the Pakistani sample.

Concerning the impact of control variables (i.e., gender, age, experience), we do not find any significant impact of gender and age on social media adoption in both samples. However, social media experience is found to have significant positive effects on social media adoption in both samples. This suggests that the individuals having more experience with social media usage may show more favorable attitude to adopt social media than the ones having relatively less experience. Table 2 summarizes all the direct effects proposed in the conceptual model.

Table 2

*Direct Effects*

Relationship	Pakistan		KSA	
	Non-Std. Est	Std Est	Non-Std. Est	Std Est
PU→SMA	0.25**	0.26	0.34***	0.26
PEU→SMA	0.23**	0.21	0.25**	0.20
PEU→PU	0.40***	0.33	0.24**	0.25
COL→PU	0.24**	0.19	0.15*	0.21
COL→PEU	0.28**	0.26	0.24**	0.32
COL→SMA	0.21*	0.18	0.19*	0.20
COM→PU	0.31**	0.27	0.17*	0.19
COM→PEU	0.39***	0.40	0.39***	0.42
COM→SMA	0.14 <sup>ns</sup>	0.12	0.20**	0.17
RS→PU	0.20*	0.17	0.18*	0.18
RS→PEU	0.18*	0.18	0.20**	0.19
RS→SMA	0.28**	0.25	0.25**	0.18
Gender→SMA	0.09 <sup>ns</sup>	0.05	0.04 <sup>ns</sup>	0.02
Age →SMA	0.01 <sup>ns</sup>	0.03	-0.04 <sup>ns</sup>	-0.03
SME→SMA	0.07*	0.09	0.10*	0.14

*Note.* \*p<0.05, \*\*p<0.01, \*\*\*p<0.001. ns = not significant, SME: Social media usage experience, PU=perceived usefulness, PEU=perceived ease of use, SMA= social media adoption, COL=collaboration, COM=communication and RS=resource sharing.

**Mediated Effects**

SEM has been used for estimation of the multi-mediation model. A phantom model approach (Macho & Ledermann, 2011) was used to test the specific effects of all the independent variables on the dependent variable through each of mediating variables. Table 3 exhibits that the indirect effects of all independent variables on the dependent variable through each of the mediators are significant for both samples at p<.05 except for the indirect effect of resource sharing through perceived ease of use (for the Pakistani sample) which is significant at p<.10.

Table 3

*Indirect Effects*

Relationship	Pakistan			KSA		
	Estimate	LB	UB	Estimate	LB	UB
COL→PU→SMA	0.07*	0.00	0.13	0.05*	0.02	0.09
COL→PEU→SMA	0.06*	0.02	0.12	0.06*	0.02	0.13
COM→PU→SMA	0.08*	0.03	0.17	0.06*	0.02	0.15
COM→PEU→SMA	0.09*	0.04	0.16	0.11*	0.03	0.23
RS→PU→SMA	0.06*	0.02	0.11	0.07*	0.01	0.14
RS→PEU→SMA	0.04 <sup>+</sup>	0.01	0.08	0.05*	0.01	0.13

*Note.* ns: not significant, \* $p < 0.05$ , + $p < .10$ , L(U)B= lower (upper) bound for the bias corrected confidence intervals, Significance levels for indirect effects are two tailed, PU=perceived usefulness, PEU=perceived ease of use, SMA= social media adoption, COL=collaboration, COM=communication and RS=resource sharing.

The significant direct (see Table 2) and indirect (see Table 3) effects of collaboration (resource sharing) on social media adoption indicate that perceived usefulness and perceived ease of use partially mediate the relationship between (a) collaboration and SMA and (b) resource sharing and SMA, for both samples. Moreover, the indirect effect (see Table 3) of communication, through both the mediating variables, on SMA is significant; whereas, the direct effect (see Table 2) is not significant for the Pakistani sample but it is significant for the Saudi sample. This shows that perceived usefulness and perceived ease of use partially mediate the relationship between communication and SMA for the Saudi sample; whereas, they fully mediate the relationship between communication and SMA for the Pakistani sample. Table 3 reports the unstandardized estimates along with bias-corrected confidence intervals.

The above results thus support the mediating effect of usefulness and ease of use between social media stimuli and its adoption. Hence, H3a, H3b, H4a, H4b, H5a, and H5b are all supported. This signifies the important role of ease of use and usefulness of social media in its adoption by the academic community.

## Discussion and Implications

The main purpose of the paper is to investigate the underlying motives behind social media adoption by the academic community. To achieve this, we proposed a conceptual framework by extending the technology acceptance model and social constructivist paradigm. In this extended model, we identified social media features such as collaboration, communication, and resource sharing as the main drivers of social media adoption by the academic community. Along with these social media drivers, we have also incorporated ease of use and usefulness as mediating variables and users' demographics as control variables. Multiple data sources have been used to test the proposed hypotheses and to assess the explanatory power of the proposed conceptual model. After controlling for the respondents' age, gender, and social media usage experience, the results reveal that the data from both countries largely support the proposed concepts. The results establish a significant role of collaboration, communication, and resource sharing in determining a

users' social media adoption decision. In addition, usefulness and ease of use of social media play a mediating role in the relationship between social media features and social media adoption. Overall, the study provides a significant support for the academic use of social media platforms, and our results are consistent with the literature (Berger, 2017; Sobaih et al., 2016).

The paper contributes to the literature by focusing on the emerging debate of social media adoption by the academic community. This study contributes to the literature on social media adoption by empirically validating the conceptual model on a sample drawn from two developing countries. Additionally, from a theoretical standpoint, the study contributes to the literature by confirming the role of collaboration, communication, and resource sharing in social media adoption, which is in line with the previous research (Mazman & Usluel, 2010; Sánchez et al., 2014).

Our results significantly support the role of the social learning environmental features of media, including communication, collaboration, and resource sharing, as the predictors of social media adoption in both countries. This shows that the academic community believes that a collaborative learning environment in a social media platform is helpful in establishing improved communication linkage among peers and colleagues.

We also find a significant positive effect of collaboration on perceived usefulness and perceived ease of use. This indicates that the individuals who adopt social media in higher education perceive this medium to be useful and beneficial in collaborating with others, which is aligned with the constructivist view of learning. The result also conforms to the work of Ebner (2009) who found social media platforms, particularly blogs, as a means of collaborative learning for students and teachers independent of time and place.

Social media platforms are capable of developing global networks for academic communities and have the power to change the educational structure by providing a direct channel of communication and collaboration among the community members (Curtis et al., 2010; Waters, Burnett, Lamm, & Lucas, 2009). This argument can be supported by social constructivism theory and computer-mediated learning (CMC) perspectives. Social constructivist theory stresses on the social interaction and collaboration while CMC supports ubiquity and emphasizes the elimination of geographical barriers. Therefore, to achieve a useful collaborative learning experience, it is necessary to build social communities of practice using collaborative learning environmental capabilities of social media platforms.

So far as the control variables are concerned, the results depict no significant effect of gender or age on social media adoption. However, social media experience is found to have a significant positive effect on social media adoption, which is consistent with the literature (Sánchez et al., 2014).

Although social media platforms are not specifically designed for educational purposes, they do have a great potential for initiating collaboration by facilitating the dissemination of information and sharing resources among the members of the academic community, whom are found to be enthusiastic about social media acceptance and adoption. The question is how social media managers, at the academic institutions, can channelize enthusiasm into actual learning process enhancement. This research will help social media

managers, in the academic institutions, to devise their strategies for the efficient management of social media platforms.

Higher education institutions should consider the importance of online communities to facilitate academic usage of social media tools. Academic institutions can create their community page on various social media platforms and invite their academic community to become its members. Depending upon the situation, various options of the public (e.g., Twitter, Facebook) or private (e.g., Yammer) social platforms may be used. The community members may be allowed to social sign-on through official email addresses. This will help other community members to search for their peers and collaborate with them.

Academic institutions in developing countries, especially in the public sector, primarily lack modern collaboration and communication tools, such as Blackboard (Sobaih et al., 2016). Effective use of social media platforms can overcome this problem. Moreover, the managers in academic institutions should devise a strategic scenario for ensuring the proper management of social media tools and platforms within a institution. For practitioners, the integration of these social media tools in their teaching and learning process will help improve the teaching and learning experience.

### **Limitations and Future Research**

The current research enriches our understanding of the social media usage by the academic community; however, in interpreting the findings one should be careful as these may be subject to certain limitations. First, the study has not focused on any particular social media platform rather social media adoption in general. However, an individual's social media adoption levels may vary for different social media platforms due to their personal characteristics as well as social media platforms' features. This will be an interesting future research avenue to explore how social media usage in the academic community varies among different individuals with different backgrounds and on assorted platforms. Second, a cross-sectional data collection has been used in this study, but due to various reasons, the individuals' behavior may change over the time so a longitudinal study can be conducted to overcome this issue. Third, although the model has been tested with samples from two different countries, Pakistan and KSA, there is not much of a difference in demographics between these two countries. Therefore, future research should replicate or extend the proposed conceptual model in technologically advanced countries with different economic and cultural conditions. Fourth, a convenient sampling has been used in the study where future research may address this issue by incorporating other sampling techniques, such as cluster sampling. Fifth, based on the extant literature, we incorporated five dominating variables to explain social media adoption in the conceptual model but many other variables, such as social influence, facilitating conditions, perceived enjoyment, and perceived connectivity, may also play an important role in predicting social media adoption in higher education. Future research may extend this model by incorporating these variables.

## **Acknowledgements**

The researchers would like to thank the Deanship of Scientific Research at King Saud University represented by the Research Centre at College of Business Administration for supporting this research financially.

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## Appendix A

### Questionnaire

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Construct	Items
<b>Usefulness</b> adapted from Davis (1989) and Venkatesh and Davis (2000):	<ul style="list-style-type: none"><li>• I find Social Media useful in my studies/research.</li><li>• Using Social Media enables me to accomplish tasks more quickly.</li><li>• Using Social Media increases my productivity.</li><li>• If I use Social Media, it will increase my chances of getting a better position.</li></ul>
<b>Ease Of Use</b> adapted from Davis (1989) and Venkatesh and Davis (2000):	<ul style="list-style-type: none"><li>• My interaction with Social Media is clear and understandable.</li><li>• It is easy for me to become skillful at using Social Media.</li><li>• I find Social Media easy to use.</li><li>• Learning to operate Social Media is easy for me.</li></ul>
<b>Communication</b> adapted from Ozkan and Koseler (2009):	<ul style="list-style-type: none"><li>• Social Media makes the communication easier with instructor/colleagues and other classmates for me.</li><li>• I think communicating with the instructor/colleagues via Social Media is important and valuable.</li><li>• The instructor/colleague encourages us/me to interact with other students/colleagues by using Social Media interactive tools.</li><li>• The instructor/colleagues are good at communicating with each other via Social Media.</li></ul>
<b>Collaborative learning</b> adapted from So and Brush (2008):	<ul style="list-style-type: none"><li>• I actively exchange my ideas with group members.</li><li>• I can develop new skills and knowledge from other members of my group.</li><li>• Collaborative learning by using Social Media is effective.</li><li>• Overall, I am satisfied with my collaborative learning experience by using Social Media.</li></ul>
<b>Resource sharing</b> adapted from Bock et al. (2005):	<ul style="list-style-type: none"><li>• Sharing of my knowledge with other members of Social Media is always good.</li><li>• Sharing of my knowledge with other members of Social Media is always beneficial.</li><li>• Sharing of my knowledge with other members of Social Media is always an enjoyable experience.</li><li>• Sharing of my knowledge with other members of Social Media is always a wise move.</li></ul>
<b>Social media adoption</b> adapted from Bock et al. (2005):	<ul style="list-style-type: none"><li>• I intend to adopt Social Media for knowledge sharing.</li><li>• I predict that I would adopt Social Media for knowledge sharing.</li><li>• I plan to continue using Social Media for knowledge sharing.</li><li>• I will continue using Social Media for knowledge sharing.</li></ul>

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July – 2018

# Analysing the Importance-Competence Gap of Distance Educators With the Increased Utilisation of Online Learning Strategies in a Developing World Context



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## Abstract

The competence of distance educators has a significant impact on learners' success. The paradigm shift for universities to become distance and electronic learning environments justifies the urgency to address competency gaps in distance educators' competencies efficiently. From a strategic human resource development perspective, the systems theory is used to explain the idea of maximising outputs with the minimum inputs (Biddle, 1986). In this study, distance educators at Unisa reflected on their experienced competency gaps. Where previous studies mainly focus on the size of the gaps, the aim of this article is to highlight the competency gaps likely to have the biggest impact. For this study, we used stratified non-probability sampling, and selected 407 academics who were, at the time of the study, permanently employed at a mega ODL university in South Africa. These academics represented a wide range of colleges, campuses, ages, and genders. The results of this study have implications for capacity building of academic staff in developing world contexts and other contexts where resources are scarce.

*Keyword:* academics, distance learning, faculty, importance-competence gap, online, staff development, training

## Introduction

The significant institutional shift from being an open distance learning (ODL) university (using a print-based mode) to becoming an open distance e-learning (ODEL) university, via an online mode, has a major impact on the work roles of distance educators (DEs) (Arinto, 2013). Technology-enhanced learning (TEL) in the Higher Education space, includes synchronous and asynchronous communication channels such as video conferencing, online messaging, e-mail, and various social media platforms (Gregory & Lodge, 2015; Naidu, 2010). Panda and Mishra (2007) ascribe increased interaction, up-to-date course material, and opportunities for collaborative learning to the use of TEL in Higher Education. They also argue that these technological innovations are responsible for the exponential growth of electronic distance learning models (Panda & Mishra, 2017).

### Literature Review

In turn, the competence of academic staff in using TEL may have a significant impact on the successful learning experience of distance learners. Preparing DEs to accept appropriate roles in an increasingly digitised environment, thus implies preparing them for a variety of evolving roles and related competencies (Bawane & Spector, 2009). From this, it can be deduced that DEs constantly need to unlearn obsolete habits and behaviours, and learn new appropriate skills, knowledge, and behaviours. Training can be used strategically to attain the goals of the organisation and its employees. Training as strategy should be linked to the business's needs, performance effectiveness, and measurement of results (Rothmann & Cooper, 2015). One of the main reasons for training is to improve the organisation's output and reduce costs (Rothmann & Cooper, 2015). Universities need professional expertise and knowledge to function effectively as large, complex, and unique organisations in modern society (Altbach, 2014). According to Altbach (2014), universities are unique because they consist of communities of scholars, are major cultural resources, and are the "quintessential public good institutions" (p. 1307). The fluidity of the environment, dictated by the transformation and innovation in TEL and student agency for affordable Higher Education, further alter the field of play for all Higher Education stakeholders (Altbach, 2014). Seal and Cross (2016) refer to the "worrisome" (p. 1514) absence of research in developing world universities such as those in South Africa. Similarly, Kaunda (2012) calls for increased research in universities in the developing world context. My research aims to address these calls.

South Africa, as part of the Global South and developing world, is required to provide education to the masses in the interest of social justice, while maintaining developed world standards (Leibowitz, Bozalek, Van Schalkwyk, & Winberg, 2015). DEs have to be empowered with the competencies they need to encourage learning in their large groups of students (Leibowitz, Bozalek, Van Schalkwyk, & Winberg, 2015). Lovelock, Patterson and Walker (1998) proposed importance-performance analysis as a very useful management tool to direct scarce resources to areas where it is likely to have the biggest impact. Seale and Cross (2016) note the internal competition for dwindling resources in South African universities and the pressure experienced by deans, to "do more with less," (p. 1522) is adding to the complexities faced by policy makers in developing world universities. This study is different from previous studies on DE competencies, in that previous studies mainly focus on identifying competency gaps (Arinto, 2013). The end result of such studies is a wide-ranging list of new competencies to be addressed, where time and money are limited. The question of where to focus immediate interventions thus remains; training interventions may incorrectly be aimed at eliminating the biggest skill gaps, regardless of whether these skills are important or not.

In addition, regarding time as a limited resource, Gregory and Lodge (2015) refer to workload as a “silent barrier” (p. 1) to the implementation of TEL, alluding to the fact that the DEs time is restricted and that therefore, they must carefully prioritise the skills training interventions they attend. This implies that universities need to find a way of investing the smallest amount of resources to achieve the most efficient and effective outcomes. To address this need, this study follows an approach originally used in business theory developed from the original importance-performance analysis (Martilla & James, 1977). This approach dictates that the specific characteristics of DEs are categorised as strengths and weaknesses in terms of two important criteria: importance and competence (Martilla & James, 1997).

Although competency models are a key tool in human resource development (HRD) and management systems and practice (Markus, Cooper-Thomas, & Allpress, 2005), existing literature acknowledges the confusion between the terms competence and competency (Axley, 2008). Some authors use the terms interchangeably (Axley, 2008), while others distinguish between the terms (De Coi et al., 2007). In their competence gap analysis model, De Coi et al. (2007) view competency as a general description of the requirements of human beings in or outside organisations. However, competencies are used to refer to the knowledge, skills, abilities, and attributes necessary to perform a job well (De Coi et al., 2007). Therefore, I believe that identifying competencies and using them as inputs to recruit, select, train, develop, and reward employees will improve organisational performance (outputs). This may also be likely to translate into an increased competitive advantage for the organisation, as the competencies needed to implement the organisations strategy can be taught.

According to Markus, Cooper-Thomas, and Allpress (2005), three main streams of interest in the concept of competency include:

1. Educational: development of skills, role outcomes, skills, knowledge, behavioural standards, narrow definition of competence as an action, behaviour/outcome/minimum standard, and award of credentials;
2. Psychological: McClelland and Boyatzis (1980) defined competencies as “a generic body of knowledge, motives, traits, self-images and social roles and skills that are causally related to superior or effective performance in the job” (p. 369); and
3. Business: The influential work of Hamel and Prahad (1989) added a “competitive advantage” lens popular with business strategists and introduced the idea of “core competencies” and “capabilities.” Sparrow (1995) added the importance of defining higher level, future-oriented organisational competencies (Markus, Cooper-Thomas, & Allpress, 2007, p. 117–118).

For the purpose of this article, distance faculty’s competencies will be used to broadly refer to the skills, knowledge, motives, traits, and capabilities required to fulfil work roles successfully. The main research question is concerned with how the competency gap of academics teaching at a distance can be bridged. In summary, this article aims to use an importance-performance analysis to make recommendations on where training interventions may have the biggest impact on bridging distance learning academics’ competency gap and in doing so, increase the effectiveness and efficiency of universities.

The ODeL context can be interpreted through the lens of the transactional distance theory (Moore, 2007), according to which the physical separation between academics and learners result in the

experience of psychological distance between them. Referring to the cognitive space between the actors in an educational setting, the transactional distance theory has gained prominence as a seminal ODL theory, due to its relevance in this segregated context (Moore, 2007). In an ODL environment, the main actors, namely the academics and their learners, experience a sense of separation that is more than just a physical distance (Moore, 2007). According to Moore (2007), transactional distance is “a psychological and communication space to be crossed, a space of potential misunderstanding between the inputs of the instructor and those of the learner” (p. 91). The transactional distance between the DE and the learner needs to be bridged, as the success of distance learners depends greatly on the ability of the DE to create a sense of community and an engagement with the new subject matter (Moore, 2007). Moore (2007) specifically notes the importance of discourse or interaction between distance learning academics and their learners, the importance of a structure that supports meaningful learning, and the degree of autonomy or self-directedness that learners possess.

The social context of this study is Unisa, a mega ODL university in the developing world context of South Africa. As resources are limited in this context, there is a lot of pressure to be accountable, uphold good corporate governance, and spend taxpayers’ money in the most efficient way possible. Furthermore, this institution is moving towards an online ODeL mode. The redesign of all modules for online delivery within a four-year period (2013–2016) put lot of additional pressure on all the university systems, but especially on academics (Poalses, Joubert, Bezuidenhout, & Nienaber, 2014). The context brings with it additional challenges and societal dilemmas such as limited broadband capacity, lack of access to the Internet by learners, student agency against an ODeL mode, and labour unrest by sections of staff feeling threatened by a reduction in the amount of printing production needed by the institution. The increasing digitisation requires new competencies from all involved stakeholders, not least of which DEs. The need for intensive reskilling and the adoption of new attitudes and values require a significant investment in time, human resources, and financial resources in universities where resources are already stretched to the limit. For this reason, it is important for institutions to identify the areas of concern where they should focus their HRD efforts as a matter of priority to make the biggest positive impact.

HRD efforts improve the competency of academics and prepare them for future work roles (Okendu, 2012). Okendu (2012) also stresses the importance of continuous HRD in highly digitised academic contexts, where knowledge becomes obsolete quickly. With specific reference to the demands placed on distance learning academics to remain current with technological changes, he emphasises the importance of HRD programmes as a tool to update the competencies of distance learning academics (Okendu, 2012). Importantly, he links the competency of academic staff members with the “maximisation of learner achievement” (Okendu, 2012, p. 31).

To fully appreciate the implications, it is necessary to consider the relationship between roles, competencies, and training needs. The lens through which this paper reports research findings is HRD theory grounded in the systems theory (Biddle, 1986). This HRD theory states that employees are expected to fulfil certain predetermined, distinguishable work roles (Biddle, 1986) for which they need to have certain competencies, comprised of skills, knowledge, and attitudes. I believe DEs need to fulfil these roles competently to facilitate successful learning (maximise outputs). Thus, clarity of expected job roles and the consequent development of appropriate competencies are essential for the optimal performance of DEs. Previous research has indicated that appropriate learning and development



programmes, underpinned by relevant competency development, are essential to equip DEs with the required skills, knowledge, and attitudes (De Coi et al., 2007; Lorenzetti, 2009; Varvel, 2007).

According to Berge (2008), traditionally, academics gained their knowledge, skills, and competence in their respective disciplines and not in education per se, and thus tend to be subject experts, rather than pedagogic experts. Adding to this, the dramatic changes in the work context of DEs over the past fifteen years has necessitated the mastery of new competencies (Berge, 2008). New expectations from learners, institutions, and society as a whole imply new tasks, roles, and responsibilities tied to the DEs' work role (Berge, 2008). As society is largely shaped by access to a wide range of information sources, including television, social media, and the Internet, learners have easy and convenient access to information, and the traditional view of the academic as the source of information has thus been altered (Berge, 2008). Learners may systematically need professors to facilitate their curation, understanding, and application of the big amount of knowledge that is freely available (Berge, 2008). Their need may be for the academic to act as a coach and mentor, instead of the sender of information (Berge, 2008).

In order to master these skills, the importance of effective staff development increases, however, Dimri and Misra (2006) acknowledge a paucity in the existing literature on staff development for distance education professionals. Norton (2008) defines staff development as the process of providing opportunities for improving knowledge, skills, and performance in line with the organisation's goals and the individual's needs. HRD and talent management interventions attempt to integrate the motivation and deployment of staff within the organisational system, to improve productivity (Norton, 2008). Current trends include staff development as a proactive, continuous, systematic process employing various activities (Norton, 2008). These activities include job rotation, coaching, mentoring, career development, performance appraisal, the building of personal strengths, and talent management initiatives (Norton, 2008). Baran, Correia and Thompson (2011) identified three aspects of current online faculty development programmes that are lacking: (a) the empowerment of academics, (b) promoting critical reflection on teaching practices, and (c) the integration of technology and pedagogical inquiry.

With the popularisation of ODL and online learning modes of delivery during the last fifteen years, change dimensions have been identified (Common Wealth of Learning and Asian Developmental Bank, 1999). Some of these change dimensions include the social context and clientele, generation, financial considerations, institutional pressures, societal changes, national programmes, and changing technologies (Common Wealth of Learning and Asian Development Bank, 1999). In my opinion, these dimensions are still relevant to the transition to an e-learning mode of delivery in most organisations.

In her research regarding the training needs of ODL academics, Bezuidenhout (2013) discovered that academics perceive regularly identifying training gaps in the fast-changing Higher Education environment as very important. The majority of academic staff members at Unisa indicated that the gaps in their competency levels were not continuously assessed (Bezuidenhout, 2013). From this flows a natural assumption that, if training gaps are not continuously and accurately identified, a situation may arise in which the university is training for the sake of training. Focussing on obsolete competencies without achieving any real change in the quality of work delivered by the parties involved may lead to frustration on the part of the institution, the academics, and the learners.

The increasing complexity of the ODL academics' job requirements thus demands strategic HRD interventions on the part of the ODL university. Although universities' resources are limited, a lack of

targeted HRD interventions may lead to a less than desirable learning experience and a perception of poor service delivery by the student population. In terms of the systems theory (Biddle, 1986), this implies that outputs are not maximised with the available inputs. The question that arises is thus how and where the available resources should be applied (transformed) to make the biggest positive difference to the skills and competencies of academic staff. This article reports on the results obtained when the importance-performance theory (Lovell, Patterson, & Walker, 1998) is used as the theoretical framework to guide policy makers in deciding where to concentrate their strategic HRD efforts, to maximise service delivery and ultimately the learning that takes place in students.

From the viewpoint of the distance learners, Berge (2008) observes that major changes in the expectations of students lead to major changes in the way ODL academics are expected to perform their jobs, adding to the new competencies expected from faculty. Limited research has been conducted from an educational point of view on the new competencies expected from ODL academics, resulting in extensive lists of competencies and required training for ODL faculty members (Arinto, 2013; Baran, Correia, & Thompson, 2011; Bawane, & Spector, 2009) while overlooking the human incumbent of the academic work role. The effect of these increasing expectations unfortunately leads to an increase in cynicism, stress, and burnout in academics (Bezuidenhout & Cilliers, 2010). Policy makers thus have to exercise discretion in adding to the job demands and workload of distance learning academics (Bezuidenhout, 2015).

In addition, universities often do not have the required resources in terms of time, money, and manpower to address all developmental needs with equal intensity and urgency. For this reason, this study focussed on identifying the importance-competency gaps that exist, with the purpose of identifying the most urgent gaps and providing institutions with some empirical evidence of where they should invest input to maximise output. The unique contribution of this research project is to identify the priority competency gaps viewed by ODeL faculty at Unisa as of paramount importance and make recommendations on how policy makers can maximise the outputs of the institution.

## Method

This article is guided by a post-positivistic paradigm according to a quantitative, cross-sectional survey design. At the time of the research, the total number of full-time academics employed at Unisa, representing the entire hierarchy, was 1 614. According to Saunders, Lewis and Thornhill (2009), based on the size of the total population, a sample of 25% of the total population would be appropriate. For this reason, we selected 404 academic staff members to take part in our study. To facilitate generalisability of the results, a stratified random sample based on the academics' age, gender, rank, and faculty were drawn. A total of 141 completed surveys were returned, representing a 34.9% response rate. The sample included seven academic faculties and various geographical sites over the whole of South Africa, including all nine provinces.

An in-depth literature review led to the compilation of a 5-point Likert scale survey instrument. The instrument collected biographical data, as well as respondents' perception on the importance of their academic work roles and their perception of their own competence in performing these roles. Respondents were requested to rate the importance and competencies from not important at all (1) to

very important (5). Finally, the academics were allowed the opportunity to add any additional viewpoints in an open question that assisted in the final interpretations and recommendations made.

## Research and Ethical Procedure

Respondents were sent an informed consent letter, accompanying the anonymous, online survey. Prior to collecting the data, permission was obtained from the ethical committee and all protocols in terms of informed consent, protection of private information, anonymity, and confidentiality were carefully observed (Unisa, 2007).

Data was imported into Microsoft Excel, checked, cleaned, and subsequently imported into the Statistical Package for the Social Sciences (SPSS). Descriptive as well as inferential statistical analysis was performed to determine the ODL academics' perception of the importance and competence related to each role, as well as to test hypotheses about significant differences between the importance and competence reported in each role. The descriptive analysis also included an importance-competence gap analysis to determine the priority training gaps that would potentially yield the biggest return on investment relatively quickly.

## Reliability and Validity

Face validity was ensured by asking a number of experienced ODL academics to analyse the instrument and make recommendations for improvement. Furthermore, a pilot study with ten respondents prior to the actual data collection yielded valuable inputs for improvement. These recommendations were implemented before the instrument was distributed. Regarding the statistical analysis, Cronbach's alpha scores were calculated for each individual question to determine how the reliability of the instrument would be affected if the question was omitted. The questions included in the final instrument all had acceptable reliability scores above the 0.7 cut-off point. The Cronbach Alpha reliability score for the full instrument was 0.955. The instrument can thus be judged highly reliable (Welman, Kruger, & Mitchell, 2012).

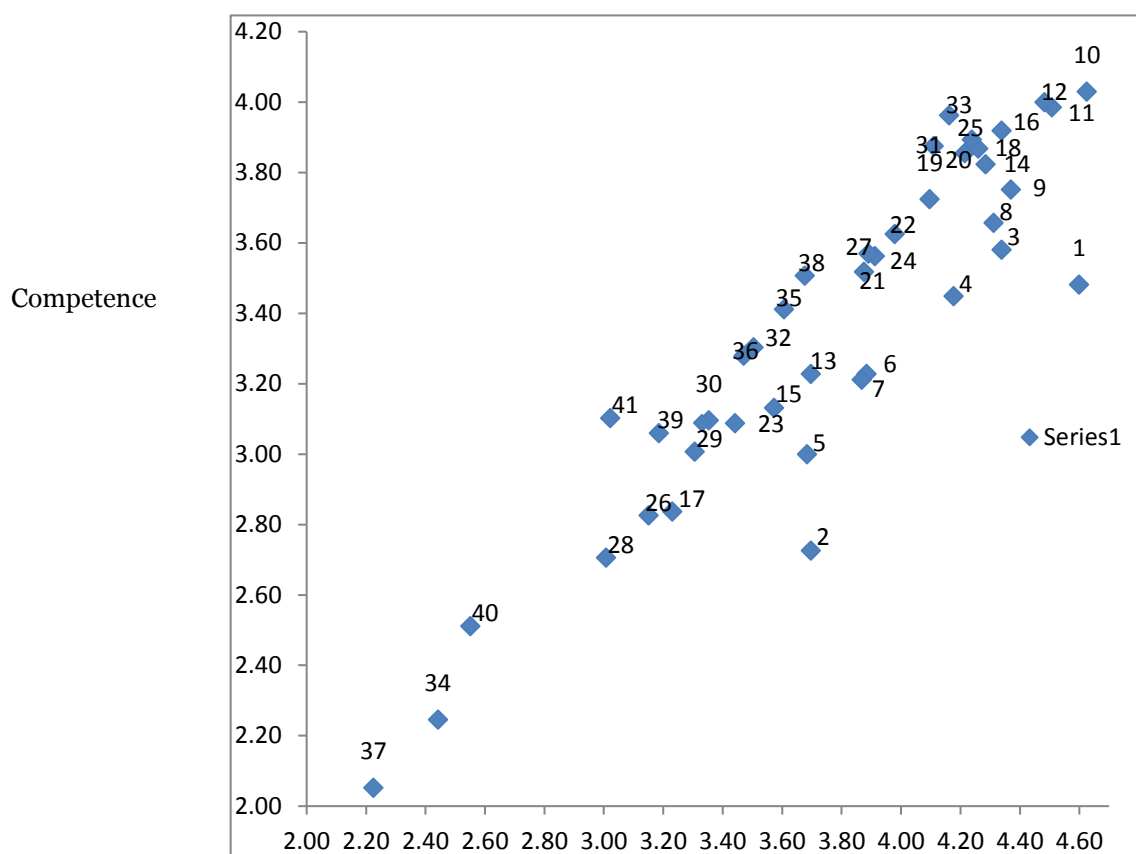
## Statistical Analysis and Results

The descriptive analysis included the calculation of frequencies and percentages of mean and median scores, standard deviation scores, skewness, and kurtosis. To facilitate the interpretation of the statistical results, an importance-competency gap analysis was performed based on the mean scores obtained. The mean scores obtained for each academic work role were depicted on the *x*-axle and the mean scores for academics' perception of their competence in each work role were depicted on the *y*-axle in Figure 1 below.

The findings below depict the eight training gaps with the highest perceived importance-competency gaps, thus the biggest differences between perceived importance and competencies per ODL academic work role.

Quadrant 2: Over investment

Quadrant 1: On track



Quadrant 3: Low potential for return on investment

Quadrant 4: Important competence gaps

Importance

Figure 1. Importance-Competency Analysis. This figure illustrates the most important training gaps of distance educators by comparing the importance of certain work roles with educators' current competence.

In Figure 1 above, the cut-off point used to categorise the different quarters was a value of 3. The reason for this decision was that any mean derived from the Likert scale above 3 indicated a positive response and below 3 a negative response. An important work role would thus be expected to score a mean higher than 3, and a less important role expected to score a mean of less than 3. The same is true for the perceived competence. If the respondents' mean scores for competence in a specific role are above 3, one could accept that they feel positive about their competence in a specific academic role and view it as a strength. A mean score below 3 would then represent a lack of competence or a weakness, indicative of a training gap. Research on competency frameworks generally stops at this point. The bigger the gap, the bigger the training need, and therefore more time and effort are invested. This article, however, adopts a different approach, in that not all gaps are perceived as particularly important. Even if the training gap is relatively large, the importance of the gap is also considered before it is identified as a

priority training gap. If ODL academics rated the work role as less important (below 3), this article argues that the university will not gain a lot by investing heavily in addressing this training gap.

Quadrant 1 in Figure 1 illustrates the high-high scenario, where academics view the role as important, but they also view their own competencies as relatively high. This quarter thus represents strengths and is labelled “On Track.” Quadrant 2 represents a low-high scenario, where the role is not important, although academics view themselves as very competent in these fields. Further training would thus definitely not be recommended in this quadrant labelled “Over Investment.” Quadrant 3 represents the “low return” scenario where, although academics are not competent, they also view these roles as unimportant. It would thus not make much sense to invest in unimportant work roles; even if there is an improvement it would not contribute much to efficiency and effectivity. Quadrant 4 represents the important training gaps (high-low scenario), where ODL academics feel the role is important, but their own competency is less than desirable. If the university could thus direct their resources towards illuminating these training gaps, it should make a relatively big difference in the outcomes.

Table 1

*The Perceived Importance-Competence Gap of Specific Academic Work Roles (N=141)*

Quadrant 1:	Quadrant 2:	Quadrant 3:	Quadrant 4:
On track (high-high)	Over investments (low-high)	On track (low-low)	Important competence gaps (high-low)
1. Researcher	None	40. Librarian	13. Policeperson to
1. Peer reviewer		34. Technician	detect plagiarism
10. Subject specialist		37. Graphic	6. Friendly online
12. Assessor		designer	environment
11. Lifelong learner			7. Pedagogical expert
16. Writer of subject material			5. Online expert
18. Course manager			2. Frequent publisher
14. Facilitator			15. Computer specialist
20. Communicator			17. Transformation agent
25. Advisor to students			36. Tutor
33. Teacher			23. Student interaction facilitator
32. Professional			29. Change agent
31. Instructor of			30. Strategist
			39. Provider of emotional

students	support to students
9. Designer of subject material	41. Counsellor
19. Team member	26. Community developer
8. Creator of new knowledge	28. Peacekeeper during online student debates
3. Supervisor	17. Transformation agent
22. Intellectual mentor	
27. Academic Citizenship	
21. Organiser	
38. Administrator	
40. Librarian	
24. Motivation	
35. Leader of Students	

After the initial gap analysis (performed based on the differences in means), a paired samples T-test was conducted to determine if the differences calculated were statistically significant at a confidence interval of 95%. The following hypotheses were formulated and tested statistically:

$H_0$  The average of the difference between the importance and the competence of academic work roles is equal to zero.

$H_a$  The average of the difference between the importance and the competence of academic work roles is significantly different from zero.

The hypotheses imply that statistically, if the P-value is calculated to be less than 0.05, the academics perceived their competence in a specific work role to be significantly less than the importance they attach to the role. The results of the statistical analyses yielded are presented in Table 2.

Table 2

*Paired Samples T-Test to Show Significance of Perceived Importance Competence Gaps*

	Role importance			Current competency			Gap	T	p-value
	N	Mean	Std	N	Mean	Std			
Researcher	134	4.59	0.728	134	3.47	1.122	1.120	11.326	0.000
Publisher	134	3.69	1.368	134	2.72	1.212	0.970	8.293	0.000
Supervisor	135	4.33	1.037	135	3.58	1.137	0.749	8.481	0.000
Peer reviewer	135	4.17	1.004	135	3.44	1.137	0.730	7.038	0.000
Online experts	135	3.68	1.163	135	3.01	1.110	0.674	5.784	0.000
Friendly	136	3.88	1.163	135	3.01	0.996	0.656	6.079	0.000
Pedagogical expert	135	3.86	1.179	135	3.22	1.182	0.640	7.11	0.000
Creator of new knowledge	136	4.30	0.855	136	3.65	0.346	0.650	7.601	0.000
Designer of subject material	136	4.36	0.747	136	3.76	0.947	0.600	6.795	0.000
Subject specialist	135	4.62	0.645	135	4.02	0.876	0.600	8.135	0.000
Life-long learner	135	4.50	0.711	135	4.00	0.855	0.500	6.409	0.000
Assessor	138	4.47	0.766	138	4.00	0.837	0.470	5.903	0.000
Police	134	3.69	1.265	134	3.24	1.056	0.450	4.215	0.000
Facilitator	135	4.27	0.850	135	3.83	0.815	0.440	5.138	0.000
IT specialist	136	3.55	1.173	136	3.13	1.078	0.420	3.816	0.000
Writer	135	4.34	0.830	135	3.92	0.939	0.418	4.889	0.000
Transformation agent	134	3.22	1.300	134	2.83	1.147	0.390	4.072	0.000
Course manager	136	4.27	0.080	136	3.87	0.909	0.402	4.01	0.000
Team member	133	4.09	0.957	133	3.72	0.932	0.366	4.234	0.000
Communicator	137	4.20	0.986	137	3.85	0.887	0.350	3.969	0.000
Organiser	135	3.87	1.033	135	3.53	0.953	0.340	3.394	0.001

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Intellectual mentor	135	3.96	1.068	135	3.61	1.044	0.351	3.921	0.000
Interaction facilitator	135	3.44	1.182	135	3.07	1.048	0.371	4.23	0.000
Motivator	135	3.91	1.089	135	3.58	0.988	0.332	3.323	0.001
Advisor to students	140	4.25	0.874	140	3.89	0.887	0.356	3.889	0.000
Community developer	138	3.13	1.283	138	2.83	1.094	0.304	3.075	0.003
Academic citizenship	143	3.87	1.067	143	3.57	1.032	0.301	3.301	0.010
Peacekeeper	135	2.99	1.296	135	2.70	1.053	0.290	2.65	0.009
Change agent	138	3.28	1.260	138	3.00	1.114	0.280	2.616	0.010
Strategist	135	3.34	1.345	135	3.08	1.113	0.260	2.6	0.010
Instructor	135	4.13	0.934	135	3.87	0.879	0.260	2.848	0.005
Professional	134	3.49	1.535	134	3.30	1.280	0.186	2.213	0.029
Teacher	134	4.16	0.995	134	3.96	0.883	0.199	2.42	0.017
Technician	134	2.44	1.186	134	2.25	1.036	0.195	2.066	0.041
Leader	135	3.59	1.242	135	3.40	1.059	0.190	1.908	0.059
Tutor	135	3.47	1.25	135	3.27	1.147	0.201	2.126	0.035
Graphic designer	135	2.24	1.170	135	2.05	1.010	0.188	1.725	0.087
Administrator	142	3.65	1.197	142	3.51	0.967	0.143	1.246	0.215
Emotional supporter	134	3.17	1.186	134	3.05	1.028	0.120	1.268	0.207
Librarian	135	2.56	1.336	135	2.51	1.184	0.050	0.403	0.687
Counsellor	137	2.98	1.257	137	3.10	1.120	-0.122	-1.069	0.287

Previous studies often only determined the training gaps by comparing the means or, at most, standardised the scores by calculating the T-scores (Chang, Shen, & Liu, 2014). This study, however, used the T-scores to determine the size of the standardised competence gaps and also analysed the importance of these gaps (as was illustrated in Figure 1). Of specific importance is thus the significant competence gaps (Quadrant 4), which are also deemed important to address after standardisation.



From Table 2, it is clear that the priority importance-competence gaps are perceived as being a frequent publisher of new research, becoming an online teaching expert, creating a friendly online environment, being a pedagogical expert, computer expert, transformation agent, student interaction facilitator, community developer, peacekeeper during online debates, change agent, strategist, tutor, emotional supporter, and counsellor.

The empirical findings confirmed that there are urgent training gaps in terms of important issues including: writing, designing, and facilitating subject material; and being a teacher, subject specialist, mentor, and supervisor to students. However, it was also confirmed that the roles in Quadrant 1 are on track. It is thus argued that in this constricted environment, academics are skilled enough to manage on the short to medium-term in these roles.

Although the academics did not perceive the roles in Quadrant 1 as a priority, it is advised that these skills should be continuously updated. It may be that they are of the opinion that these are not pressing needs as they are skilled and experienced enough to cope, and that there are other more pressing needs where a bigger difference could be made.

## Discussion

In addressing the call for more research in universities in the developing world (Kuanda, 2012) and the recognition of the challenge of an “expanded scope of their job” (p. 1519) and “management requirements,” (Seale & Cross, 2016, p. 1519) this research aims to provide some guidance on how to allocate scarce resources to “get more for less” (Seale & Cross, 2016, p. 1524). Restricted resources imply that developing world universities need to plan strategically and use their available resources where it is likely to have the biggest organisational impact. Organisations, including universities, should commit their resources to those training activities that can best help in achieving its objectives (Rothmann & Cooper, 2015). The importance-competence analysis used in this paper aims to guide decision-makers towards having the most significant impact and fostering positive change over the shortest possible time period. From my point of view a performance-competency analysis may be beneficial in deciding how to distribute available resources to achieve the most efficient outcomes possible. I believe that as the job of the DE continuously becomes more complex and varied, generic training programmes increasingly become irrelevant and the demand for targeted strategic HRD efforts progressively increases.

Current academic requirements in Higher Education institutions worldwide include excellent teaching practices and enabling course structures that enhance the learning experience and encourage interaction (Okendu, 2012). Thus, increased competency of academics is associated with more successful learning (Okendu, 2012), and successful learning ultimately leads to successful students and effective organisations. The success of universities as organisations is thus dependent on the competency and skill of academic staff members.

The question is thus not if training gaps should be addressed, but how the process should be managed to bridge the competency gaps of distance learning academics’ in the most efficient way possible. For this reason, it was decided that that the importance-performance theory of Lovelock et al. (1998) would offer an appropriate lens to study where scarce resources should be allocated at Unisa to have the

biggest positive impact. We believe that the importance-performance theory will also enable university policy makers to decide which learning interventions to prioritise for their academic staff and which to leave to the medium term, as well as to identify those work roles where even significant time and effort spent on training will likely lead to little improvement in organisational effectiveness. In an environment of dwindling resources (inputs), it may be advisable to address these challenges at a later stage.

In most universities, including Unisa, the three pillars of the academic job include: (a) research, (b) teaching and learning, and (c) academic citizenship (Unisa, 2016). In our study, the first six priority competence gaps, indicated in Table 2, mainly allude to the first two aforementioned pillars. These significant competency gaps necessitate the exploration of the possible implications for distance universities as entities, as well as individual academics per se. The discussion of the research results will be structured following these two pillars as sub-headings.

### **Research Competencies**

The first training priority reported by educators, referring to becoming a frequent publisher of new knowledge, may be indicative of the managerial pressure that academics experience to publish new research results consistently. When interpreted from a systems theory perspective, this implies that quality outputs must be produced at a rapid rate, without necessarily increasing inputs in the form of increased resources, a scenario described by Seale and Cross (2016) as “doing more with less” (p. 1523). The empirical results thus show that academics experience a need to improve their knowledge, skills, and attitudes about these scholarly activities to enable them to produce more outputs faster. The pressure to publish has to be interpreted against the milieu of intense competition between universities, as well as within the same university, which gave rise to the whole idea of “academic productivity” (Jamieson, 2004, p. 22). Unfortunately, evidence suggests that the demand for increased quantity often overrides scholarly concerns for quality of publications (Jamieson, 2004).

I believe the idea that teaching and research are necessarily two separate activities is obsolete. Schouteden, Verburgh and Elen (2016) stress the importance of informing teaching through research activities. Davis, Jansen van Rensburg, and Venter (2016) note the drive towards holding faculty accountable for both the quality of research, and the quality of teaching and learning via the use of integrated objectives and performance management. However, a general paucity of insight on how to integrate research findings into teaching hampers the process (Davis et al., 2016). In my opinion faculty should thus be supported in learning new skills to conduct appropriate research effectively and use the findings to inform their teaching and learning practices.

### **Teaching and Learning Competencies**

The empirical results indicated that distance faculty experienced an important and immediate need to learn how to become online experts using TEL, create a friendly online environment, and become pedagogical experts. The results of this study thus prove distance learning faculty in a developing world context need to learn how to facilitate learning by creating a sense of online community. It seems that respondents perceived that to become successful digital academics, they need to learn how to be digital conversation stimulators, coaches, and mentors. This may be related to what Siemens (2008, p.10) coined “connections” between specialised information sets. Digital academics thus need the ability to guide learners to form connections between complex information sets as more complex information is

continually acquired. This ability should support students in learning how to navigate an increasingly complex and changing world.

It is noteworthy that for learning to be effective, these skills should be taught in an integrative manner, in which distance learning academics are taught to apply pedagogical principles effectively with the support of computer technology.

## Conclusion

In conclusion, this article contributes to the body of knowledge by showing that simply offering a list of training programmes in itself is not good enough to bridge the competency gaps of distance learning academics' in developing world contexts. The article illustrated that the complex university contexts in developing countries demand an approach where outputs are maximised within the constraints of economic reality. Strategically, for distance learning universities to remain competitive, it is imperative that they engage in targeted, custom-made training and development interventions based on importance-competence analyses. Therefore a holistic approach where both the size of the training gap, as well as the importance and urgency of addressing the training gap is acknowledged, is proposed as one method of expanding existing resources to achieve better results in equipping distance faculty with desperately needed knowledge, skills, and attitudes. In future, faculty development programs should thus consider both the size of the gap, and the importance of the gap to the individual faculty member and the university. These programmes should aim to maximise return on investment by focussing on interventions in which the biggest difference can be made, with the limited resources available. The results of this study emphasize the importance of timeously directing available resources towards interventions that will empower faculty to integrate sound pedagogical principles with new technology. This is a break from traditional approaches, within which the biggest training gaps receive priority attention, and the educators' perceived importance of the skill or knowledge gap (which impacts their ability to perform their jobs) is not considered.

Future research, investigating if the identified competencies are also regarded as important and urgent in other universities, and specifically in other distance learning universities, globally, would be insightful. The main limitation of this study was that the research was conducted in only one mega distance learning university and should therefore be replicated in other universities, before the findings may be generalised.

As Higher Education faces numerous challenges and practical constraints, it is hoped that this article will provide a new perspective on how to address some of these challenges in a responsible and strategically responsive manner. The new knowledge presented in this article presents a novel way of managing scarce university resources, to the benefit of the whole Higher Education community, namely distance learning academics, learners, and universities alike.

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July – 2018

## **A Playful Approach to Fostering Motivation in a Distance Education Computer Programming Course: Behaviour Change and Student Perceptions**



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### **Abstract**

The central role of motivation to learn in distance education has been noted, and gamification has been proposed as one approach to promote student motivation. This study explores promoting motivation in a distance education, third-year computer programming course via a gamified approach to improve coursework participation and student experience. Motivation was examined from a Self-Determination Theory (SDT) perspective, as gamified approaches often rely on external motivation and the explicit use of competition to engender internal motivation leading to desired behaviours. The results of using gamification in education are mixed, and its use is controversial. Two cycles of action research on the introduction of eight playful elements are reported on, and data relating to student engagement with the course and a student questionnaire was gathered. There was little evidence that the intervention led to behaviour change or improved scores; however, students responded very positively to the intervention, although some negative themes emerged. The extent to which the playful approach supported the basic psychological needs of SDT is discussed and the intervention's results critically considered, including whether the effort involved in such an approach was worth it. It was concluded that such playful approaches might have positive motivational effects.

*Keywords:* motivation, self-determination theory, guided didactic conversation, gamification, distance learning



## Introduction

The central role of motivation to learn in distance education has been identified, and it is recognised as a good predictor of student retention and success. Specifically, a motivated student will spend time and effort on something that motivates him/her (Buckley & Doyle, 2014; Chen & Jang, 2010; Hartnett, St. George, & Dron, 2011; Simpson, 2008, 2012). Distance learners are also particularly vulnerable to the loss of motivation due to various reasons: feelings of isolation and limited face-to-face interaction, lower levels of engagement, a sense of lack of making progress, and time pressures brought on by mixing studies with family and work (Abu-Dawood, 2016; Butgereit, 2015; Keller, 1999; Simpson, 2012). Motivation may also be affected by the reason a student is taking online, distance studies (Chen & Jang, 2010): out of interest or self-fulfilment, aiming for a better salary, or simply because there are limited opportunities in more traditional, face-to-face learning institutions where learning at a distance is not the student's first choice (Simonson, Smaldino, Albright, & Zvacek, 2012).

Gamification may be seen as the explicit use of competition to promote student motivation (Buckley & Doyle, 2014), and the use of the motivational power of games does not seem unreasonable (Sailer, Hense, Mayr, & Mandl, 2017). There is increased interest in using gamified approaches in education as a means to hook, and hold, student attention and interest, as well as there being evidence that these influence student behaviour (Buckley & Doyle, 2014). In a sense, education is already gamified: students earn marks for completing tasks, which are translated into grades at the end of a year, which then allow a student who has performed well to level-up to the next grade or year (Buckley & Doyle, 2014).

It has been pointed out that programming courses are considered difficult, have a negative image among students, and usually rely on practice to become comfortable with their abstract and complex concepts – all factors that mitigate against building motivation (Butler & Ahmed, 2016; Fotaris, Mastoras, Leinfellner, & Rosunally, 2016; Pineda-Corcho & Moreno-Cadavid, 2017). This study investigated whether a playful approach to a distance education programming course could motivate students to increase their participation in the work of the course. Furthermore, it considered how students experienced this approach. Specifically, the following research questions were asked:

- To what extent would a playful, gamified approach change student behaviour and lead to increased levels of participation in the work of the course? Would it lead to improved levels of achievement in assessments?
- How would students experience this type of intervention in their learning?

This work was viewed through the framework provided by the Self-Determination Theory (SDT) of motivation, which will be discussed first. Following this, the Guided Didactic Conversation theory of distance learning and the role of gamification and play in higher education will be explored. Thereafter, detail is provided on the research methodology employed and how the intervention was implemented. After examining the results of the study, these will be discussed and recommendations for future work considered.

## An Understanding of Motivation

Although motivation is sometimes seen as a fairly stable, single-dimension characteristic that students display (Hartnett et al., 2011)—they either have it or not—others have argued that it can be changeable due to the lack of control over the many factors that influence it (Keller, 1987). Motivation is considered multidimensional in that it can vary both in level (how motivated a student is) and orientation (the “why” or type of motivation; Ryan & Deci, 2000).

SDT is based on research examining the effect of extrinsic rewards on intrinsic motivation (Deci & Ryan, 2012), and as gamified environments are often very reward based, SDT could provide a solid background from which to explore the motivational effects of gamification. SDT has also been recognised as a useful approach, or theoretical framework, to investigate motivation in online, distance education environments (Chen & Jang, 2010; Hartnett et al., 2011; Simpson, 2008; Xie, Debacker, & Ferguson, 2006) and, thus, was considered a suitable basis for this study.

SDT broadly distinguishes motivation on an intrinsic-extrinsic-amotivation continuum (Ryan & Deci, 2000). To be intrinsically motivated is to do something because it is believed to be internally rewarding in some way, whereas extrinsic motivation has to do with tasks that lead to some external outcome such as peer approval or career advancement (Ryan & Deci, 2000). SDT is made up of several constituent theories; relevant ones are explored here. Basic Psychological Needs Theory identifies the three universal psychological needs that form the basis of SDT (Deci & Ryan, 2012; Robb & Sutton, 2014; Ryan & Deci, 2000):

- Competence (where positive feedback builds students’ feelings that they are capable)
- Autonomy (the extent to which students feel that they can autonomously self-determine their actions based on an internal locus of causality)
- Relatedness (where students feel valued by others as individuals in a community context of belonging and connectedness)

All of these may be addressed in online learning environments through task submission and feedback, study flexibility, and collaborative learning via computer-mediated channels (Chen & Jang, 2010).

Building motivation involves creating a learning environment where competence, autonomy, and relatedness are supported in order to facilitate higher levels of intrinsic motivation, ultimately leading to improved learning. Cognitive Evaluation Theory (CET; Deci & Ryan, 2012; Ryan & Deci, 2000) argues that it is not always possible to rely on intrinsic motivation and considers the effect extrinsic motivation has on intrinsic motivation. Any external locus of control frustrates autonomy and plays against intrinsic motivation. External, tangible rewards then undermine intrinsic motivation, as these try to enforce a particular behaviour. Furthermore, although positive feedback can build feelings of competence, this only leads to increased intrinsic motivation in autonomous environments. Similarly, social relatedness can also be autonomous or controlling, leading to either intrinsic or extrinsic motivation. Thus, where lecturer participation, feedback, and peer interaction in online courses are seen to be critical to student motivation (Xie et al., 2006), these can be understood as building confidence in a context of a supportive lecturer attitude that builds relatedness.

However, extrinsic motivation need not always be controlling. Organismic Integration Theory (Deci & Ryan, 2012; Ryan & Deci, 2000) suggests a continuum of extrinsic motivation, from external regulation to integration. Extrinsic motivation is integrated when it can be internalised and is autonomous, where actions are taken freely with a sense of volition, reflecting an acceptance of the value of the task. Therefore, cultivating learning environments that show students the value of a task can lead to identification with, and integration of, the task, where the locus of causality becomes more internal and endorsed. Relatedness, in trusting and caring relationships that are responsive to others, allows a student to identify with the value of a behaviour and it becomes integrated in his/her core values. The focus, therefore, is on autonomous versus controlled motivation (Deci & Ryan, 2012). This can be seen in studies where the controlling requirement to participate in online activities could be interpreted autonomously by students, as they identify with its value to them (Xie et al., 2006).

There are several other theories of motivation that could lead to strategies similar to SDT. The ARCS model (Attention, Relevance, Confidence, Satisfaction; Keller, 1987) picks up on sustaining attention through showing the relevance of actions in satisfying needs and accomplishing goals. Similarly, Goal Achievement Theory considers behaviour determined by performance goals that may be linked to competition with peers (Simpson, 2008). Also Self-Worth theory considers how performance can be regulated by maintaining self-worth and avoiding failure (Seifert, 2004). These may also be used to evaluate gamified approaches to learning, but will not be explored further here.

## **Guided Didactic Conversation**

Distance education may be understood as a dialogue between lecturer and student, and this transactional approach can be seen in the teaching and learning process proposed by Holmberg (1983, 1999). Guided Didactic Conversation recommends that the communication process take on the character of an accessible conversation. This can be interpreted in two ways: firstly, there is a conversation in the form of contact via assignment questions and answers, emails, and telephone calls; secondly, it advocates a conversational style to promote feelings of a personal relationship. The argument is that building a personal relationship through conversation leads to greater personal involvement on the part of the student, and thus greater motivation to learn.

The conversation, however, is simulated, and often asynchronous (Garrison, 2000). Although originally based on paper correspondence, current technology allows for the conversation to be accomplished in a variety of forms, including audio and video podcasts, email, and virtual face-to-face meetings (Garrison, 2000; Kelsey & D'Souza, 2004).

## **Gamification and Play**

### **Understanding Gamification**

Although gamification can support and enrich teaching and learning (Butgereit, 2015; Deterding, 2012), it is not uniformly understood and has no universally accepted definition or collection of elements (Bartel & Hagel, 2016; Sailer et al., 2017). It has been defined as “the use of game design elements in non-game contexts” (Deterding, Khaled, Nacke, & Dixon, 2011, p. 2), with the aim of tapping into the

need for reward to increase engagement and motivate required behaviours (Deterding, 2012; Fotaris et al., 2016; Hung, 2017). Explicit use of game design and competition is engendered through the implementation of an interactive narrative context with goals, points, player levels, badges, and leader boards (Buckley & Doyle, 2014; Butgereit, 2015; Sailer et al., 2017).

While programming and game environments have much in common—such as difficult challenges where practising strategies can build mastery (Barik, Murphy-Hill, & Zimmermann, 2016)—it is important to distinguish gamification from other forms of games used in education (Buckley & Doyle, 2014). In game-based learning, games are integrated in the learning context, where the content of the game is the material to be learned (Hung, 2017; Sailer et al., 2017). Gamification, however, simply provides an additional layer of rewards and reputation levels on top of the usual activities that make up a teaching and learning context (Deterding, O’Hara, Sicart, Dixon, & Nacke, 2011).

Gamification has been used in a multitude of environments, both outside and in education (Denny, 2013; Deterding, O’Hara et al., 2011; Sailer et al., 2017; Van Roy & Zaman, 2017). In computer programming education, it is believed that games thinking would be more understandable to computer science students (Hung, 2017), and such game-like approaches have been reported on (Barik et al., 2016; Bartel & Hagel, 2016; Di Nunzio, Maistro, & Zilio, 2016; Fotaris et al., 2016; Harrington, 2016; Maia & Graeml, 2015).

The results of using gamification, however, are mixed (Hung, 2017). There are cases where positive results were noted in student behaviour, engagement, motivation, and experience (Bartel & Hagel, 2016; Butgereit, 2015; Denny, 2013; Di Nunzio et al., 2016; Fotaris et al., 2016; Harrington, 2016) as well as in learner performance (Van Roy & Zaman, 2017). However, there have also been cases where no significant difference was recorded in student results (Hung, 2017). It should be noted that gamification may also lead to unwanted effects and may even result in worse results than those experienced before gamification was introduced (Barik et al., 2016; Van Roy & Zaman, 2017).

## Criticisms

Gamification, however, does not enjoy universal approval and is controversial (Hung, 2017). It has been argued that it relies on the incidental parts of games that hold players’ attention (Bogost, 2014; Robertson, 2010), and that it is deceitful and coercive in that it uses exploitative reward tactics to achieve required behaviours and compliance (Bogost, 2014). Hopefully, the motivation to use it in education is to benefit the student (improved marks) rather than simply make the lecturer look good (improved pass rates).

It has also been suggested that gamification takes the power of games and replaces it with *exploitationware* and *pointsification*: safe and predictable dynamics where the power and possibility of games become mere technological solutionism to promote meaningless interaction (Bogost, 2014; Hung, 2017; Robertson, 2010). Aspects of gaming that are often missing in gamified contexts are (Robertson, 2010):

- the nature of the game (interestingly difficult rather than simply a slog);
- the possibility of meaningful choices that affect what happens later in the game (rather than a required path through a set menu); and

- emotional involvement where a player's life is at stake (where gamification rarely involves loss).

Robertson (2010) acknowledges that points and badges may be used as tools to indicate progress, but challenges the belief that it is these elements that make up the core of a game; they are used in gaming much like they are used in traditional education—to show achievement.

## Play

The notion of play as an important aspect of culture and society has been highlighted by Huizinga (1970), where it acts to support something that is not play—the teaching and learning of programming, in this case. However, a playful approach can embody some of the characteristics of play, as highlighted by Huizinga (1970):

- It is a voluntary activity where learners choose whether they want to participate or not.
- Play is not real life, but a fun activity. In a sense, then, the learning of programming is the real-life context, whereas the gamified layer on top of this forms the playful part.
- Play takes place in a playground with limits to its time and place. Again, a gamified context is limited to the reward layer of the learning environment.
- Play has rules, which are embodied in the points offered in a gamified approach, where the points, and their associated badges and levels, are awarded for completing specific tasks.
- Play has a differentness expressed in the uniforms worn by players. Avatars and game-names combine to display this differentness and to disguise the individual (who becomes someone else, in a sense).

Students, then, play the game of learning programming, while the gamified approach adds a playful process to that learning. The approach used here is characterised as playful rather than gamified in recognition of the criticisms of the term “gamification,” and fun is used as a dynamic rather than an attempt to turn the course into an actual game.

## Methodology and Implementation

### Research Design and Methods

The research design used in this study was action research, with two cycles reported here and suggestions from the evaluation for alterations that could be made leading to further cycles. The underlying philosophy of action research is pragmatism, where action should lead to practical consequences (Baskerville & Myers, 2004), which, in this specific case, would be motivating distance students to participate more actively in the programming course and with its learning content. This pragmatist grounding provides action research with its focus on finding truth in practical outcomes, with reason and action together leading to change, change that occurs as human social interaction shapes action (Adams, 2010; Baskerville & Myers, 2004).

Action research has social change as one of its primary goals (Adams, 2010). It is a longitudinal, iterative, and continuous approach that cycles through phases of planning, acting, observing, and reflecting, making it more of a process of learning for, in, and from practice than a single event (Adams, 2010; De Villiers, 2005). The role of the researcher is that of practitioner-researcher, where a lecturer examines his/her own practice, and is, thus, very responsive to data collected and flexible in reactions to findings from the observations (De Villiers, 2005). This close relationship to the research means that any interpretations may be limited (Adams, 2010) and that the researcher has to be very aware of his/her own values around what constitutes learning and what he/she believes a student should be doing.

A multi-method approach to data collection was used:

- Statistics relating to the number of interactions on the learner management system, as well as the number of assignments submitted, were collected for all students for the time period of 2014 to 2017.
- Students for the two semesters in 2016 (S1 and S2) and one in 2017 (S2), when the approach was used, were surveyed using Likert-type scales, multiple-choice options, and freeform responses near the end of each semester. Questions related to student demographics, and response to, and participation in, the gamified approach. Participants included all the students registered for the course during the semester (except where students asked to be excluded from the intervention). Of those who responded, the majority were male (78%), with ages ranging from 21 to 51 years of age (the average being 31), and mostly registered for the Bachelor of Science in Computing programme (73%). No other demographics concerning the participants is known.

Ethical clearance was obtained from the appropriate university committees, both to do the research and to use university data.

### **Learning Intervention**

In an attempt to motivate students and increase engagement with a programming course, it was decided to introduce a fun or playful element in the course. The context was a third-year programming course required for a major in computer science offered only via a distance education online mode. It is not proposed here to turn programming into a game, but to use playful elements to engender motivation. Participation was measured by considering the number of students who introduced themselves online and their comments to other students, the number of students who submitted each of the two set assignments (where just one assignment was required to gain examination admission), and the marks obtained for those assignment tasks. The approach was implemented in two semesters in 2016 (Cycle 1) and the second semester in 2017 (Cycle 2).

Eight game mechanics were included in the approach:

- A journey motif provided the overarching story, involving a destination or goal, tasks that needed to be completed along the way, and a means of measuring progress.
- Students provided known-as names and introduced themselves in an on-boarding process.

- Set tasks (the two semester assignments) provided short-term goals.
- Points were awarded for completing tasks: submitting known-as names, participating in the introductions, taking part in quick quizzes, and submitting assignments. Assignment points were awarded based on the mark achieved for the assignment.
- Badges were issued for completing tasks (such as a Greeters badge for introducing oneself in the online discussion forums) and for indicating levels of progress (such as three different assignment badges based on the assignment mark achieved in each assignment). Thus, badges were awarded both for performance and competence (Van Roy & Zaman, 2017).
- A leader board was maintained, and student rankings were sent out after major tasks along the journey.
- Four levels (reached on gaining a set number of points) were used to provide intermediate goals: Roamer, Rambler, Rover, and Ranger. Badges were also associated with each of these levels.
- Individual and group feedback loops were provided via email on a regular basis. Badges, points, and rank status messages were sent to individual students; summary messages (such as the number of students at each level) were sent to all students via the university learner management system.

The differences in game-mechanic implementation from Cycle 1 to Cycle 2 were as follows:

- A journey-specific website was added in Cycle 2. This website was used to indicate progress such as how many badges of each type had been issued.
- The leader board was kept private in Cycle 1, and although students received emails indicating their rank, they could not see where others were placed. A public leader board was introduced in Cycle 2 and was published on the journey website. The student-provided “known as” names were used where available; otherwise, anonymised student numbers were used.
- Motivational emails were sent to students in Cycle 2. These were sent out at set points throughout the semester after significant points in the journey (such as the release of the assignment marks and solutions). This game mechanic was implemented following a similar strategy used in another distance learning environment (Keller, 1999).

## Results

### Behaviour Change

There was little evidence that the gamified interventions led to much behaviour change or improved scores (see

Table 1).

Table 1

*Course Statistics for Students Registered for the Programming Course*

	2014 S1	2014 S2	2015 S1	2015 S2	2016 S1	2016 S2	2017 S1	2017 S2
Action research cycles					Cycle 1	Cycle 1		Cycle 2
Number of introductions			78	53	112	157		122
% of "known as" names					34	31		19
% of Assignment 1s submitted	86	90	91	89	91	91	89	98
% of Assignment 2s submitted	53	58	58	58	50	61	63	67
Average % for Assignment 1	43	52	43	49	45	55	60	44
Average % for Assignment 2	49	51	46	42	53	55	69	50
Examination pass rate	41	56	47	42	43	42	42	44
Examination average %	45	47	48	44	45	44	40	46

Although the number of online introduction interactions doubled, few students sent in names to be known as on the journey, with the numbers decreasing since the first intervention. It should be noted that the low number in 2017 S2 could have been as a result of students not expecting the gamified approach to be continued in the semester after it had not been used in S1.

It was also clear that there had been little effect on the percentage of assignments submitted during the first action research cycle in 2016 S1 and S2, although there did seem to have been an increase in the second cycle (2017 S2). Similarly, the average marks for the assignments changed little from before the interventions were implemented, as did the examination pass rates and examination averages. It is noteworthy that higher than average results were obtained in 2017 S1 assignments when there was no journey approach, indicating that there were other factors at play there.

### Student Perceptions

Student perceptions of the approach, based on 30 survey responses from the first action research cycle (a 9% response rate) and 37 from the second (a 22% response rate), were very positive. Of those who responded to the survey, 84% enjoyed the approach, with the remainder having no opinion (see Table 2). Also, when asked about how their attitudes towards the journey had changed from start to end, five respondents' opinions moved in a negative direction, with 10 remaining neutral; the rest either were, or became, positive towards the approach (see

Table 3). Note that no respondents changed from positive to negative or from negative to neutral.

Table 2

*Overall Response to the Playful Approach Adopted in the Course*

Cycle	Number of students	I loved it	I liked it	I really have no opinion	I did not like it	I hated it
Cycle 1	30	11	15	4	0	0
Cycle 2	37	10	20	7	0	0



Table 3

*Attitude Change Towards the Playful Approach Adopted in the Course*

Cycle	Number of students	Positive to neutral	Negative to positive	Remained neutral	Neutral to positive	Remained positive
Cycle 1	30	1	2	4	13	10
Cycle 2	37	4	1	6	15	10

The respondents also largely agreed that they had actively participated in the journey, that it had helped maintain their motivation, and that it had led to positive behaviour changes (see Table 4). It must be acknowledged that the respondents mostly came from students who had progressed far along the journey, where 50% had reached the two highest levels (Rover and Ranger; see Table 5).

Table 4

*Student Response to the Use of the Playful Approach*

Choice	Cycle	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
I actively participated in the journey	Cycle 1	8	12	8	1	1
	Cycle 2	2	13	14	4	4
The journey helped maintain motivation	Cycle 1	9	11	6	2	2
	Cycle 2	4	17	6	4	6
The journey led to a positive behaviour change	Cycle 1	6	14	6	3	1
	Cycle 2	5	17	7	2	6

Table 5

*Levels Reached by Students Participating in the Survey*

Cycle	Number of students	Roamer	Rambler	Rover	Ranger	I do not care	I do not know
Cycle 1	30	4	4	7	14	1	0
Cycle 2	35	8	9	7	6	0	5

A thematic analysis of the free-form responses identified the following themes, which could be separated into positive and negative categories. Actual responses from students are indicated by participant numbers in this reporting. Five positive themes were noted:

1. Confidence in making progress: students noted that “It shows my progress” [P6] and that it was “good for me to see how I stack up against other students” [P14], leading to comments that it “gave me confidence” [P13] and “a sense of accomplishment” [P17]. Furthermore, it provided a “[s]ense of direction” [P35].
2. Motivation: students felt that the approach “motivated me to study harder” [P7] through “keep[ing] you involved” [P33] and “had a small goal to work towards” [P38]; it “acted as a motivator” [P10]. It was noted that “competitiveness motivates” [P49].

3. Competition: some students noted that they “liked seeing where I was ranked in the class” [P4], and in the first cycle, requests were made for the leader board to be made public. There was also the request for more ways to earn points, such as more quick quizzes.
4. Being connected: a common thread was that the approach “makes the experience more personal” [P8], where “the lecturer ... is actively involved” [P16], “available” [P41], and “hands on” [P32]. There was also the feeling that the approach helped students feel connected to other students.
5. Unique approach: students often found the journey “innovative” [P39], “different but quite exciting” [P9], “fun and engaging” [P10], and “encouraging” [P58]. There were even comments that “all modules would greatly benefit from having this approach” [P4].

However, four negative themes also emerged:

1. Added expectations: there was the feeling that the journey “put a bit more pressure on me” [P16] and that there was now extra “pressure to fulfil all the requirements” [P12] because “more was expected of me” [P16] over and above what already had to be done to fulfil the requirements of the course.
2. Disappointment and discouragement: students felt that “I could of done better” [P24] and were “disappointed in myself for not allocating sufficient time to complete assignment 2” [P16]. There was also the realisation that “I would have been discouraged if I had obtained a low rank” [P17].
3. Time pressures: the extra pressure that was felt led to students indicating that “I did not have the time to be involved in it” [P5] and that the “journey work load was too much for me” [P64], and so they did not actively participate.
4. Indifference: one student noted that “I think people don’t really care” [P31], indicating some indifference to whether this approach was taken or not.

## Discussion and Future Work

A playful or gamified approach to presenting a computer programming course in a distance education environment needs to support the three basic psychological needs proposed by SDT rather than be a narrow points-badges-leader board approach (Van Roy & Zaman, 2017). Such reduced-complexity approaches may well fail to engage students (Deterding, 2012). It must be acknowledged that the journey storyline may have been too weak to act as an overriding purpose for completing tasks, in that it did not relate directly to the programming tasks and remained an unintegrated layer on top of the usual programming tasks required in the course.

The awarding of points and badges for successful assignment submissions can help build feelings of competency in students. In a sense, then, the points, badges, and levels act as supportive feedback indicating a student’s progress as well as adding a sense of “guided conversation.” However, the immediacy of this feedback can be problematic. Although immediate feedback is achievable for small

self-assessment-type tasks where automatic feedback can be provided in an LMS, it remains a problem for the larger programming assignments that can take several weeks to finish marking. It is possible that it was this need for rapid feedback (as well as more ways to earn points and progress to the next level) that led to students requesting more quick quizzes. However, wanting more tasks could also represent the need for more dialogue with the lecturer. Furthermore, there was the assumption that distance students, who might additionally be part-time students, had the time to devote to their studies as well as the time to participate in the journey. It could be such a lack of time that contributed to demotivated students (Xie et al., 2006), and motivation to continue with the journey may also be lost if students do not do well in assignments and so fall behind on the leader board, leading to loss of interest in the journey (Fotaris et al., 2016).

To maintain the autonomy of students and the flexibility of the journey, it was decided not to make participation in the journey compulsory and, thus, to try to build a less controlling form of motivation through voluntary participation. This was also done to recognise that not only were not all students motivated by a ranking on a leader board (Bartel & Hagel, 2016), but that it was possible that being ranked against peers might demotivate some students (Abu-Dawood, 2016; Buckley & Doyle, 2014). Furthermore, the student also maintained the choice of name by which he/she was known, adding to the sense of autonomy (Sailer et al., 2017). It needs to be noted, however, that beyond this, there were little flexibility and a lack of options as far as the journey itself was concerned: the set assignments were compulsory, and there were no options providing alternative pathways through the course. It is, thus, possible that such lack of provided autonomy may demotivate students and lead to the indifference that was noted.

Feelings of relatedness were built through the on-boarding process of having a known-as name and introducing oneself on the discussion forums, where there might be a realisation that the student was not alone in this learning journey. Establishing such an identity also supported the second stage of the five-stage model for online teaching and learning (Salmon, Nie, & Edirisingha, 2010). Furthermore, regular emails sending out badges and updating students on their points and rank status supported the need for relatedness and dialogue, as did a public website where students could see that others were on this journey, too. While interaction may be supportive of success in distance education courses (Kelsey & D'Souza, 2004), it is a myth that more interaction leads to better learning (Simonson et al., 2012). Research has indicated that students welcome contact specifically with their lecturers (Kelsey & D'Souza, 2004), a view that was supported by the appreciation shown by students of the journey in this study.

A gamified approach involves a lot of effort, and it is necessary to ask whether it is worth this effort, especially as success is not guaranteed (Bartel & Hagel, 2016). Considering the positive effect that it had on student experience and that some students felt motivated and encouraged by the journey, one cannot deny that it may have a place among all the other interventions that are implemented in such courses in an attempt to meet the learning needs of a range of different students (Buckley & Doyle, 2014). However, it is probably not the form of gamified approach to be taken if the aim is to improve marks and pass rates. This would be in keeping with the arguments made by the authors upholding the “no significant difference” phenomenon—that there are too many variables that lead to success in education and that one intervention is unlikely to lead to any significant difference in student achievement (Conger, 2005).

This work could be extended in further cycles of action research by considering options for redeeming points and the use of avatars in addition to journey names. Extra ways of earning points could be added through the addition of more self-assessment tasks and even the inclusion of examination marks (as this is the only part of evaluation in the course that was not included). To encourage student-student engagement, points could also be awarded for contributing to discussions on the discussion forum (Harrington, 2016). A larger task would be to consider changing the programming assignments to match the journey theme. The approach is also limited in that it could not be integrated into the university's learning management system, and it would be worth exploring whether this would increase participation.

## Conclusion

Aiming to build motivation among distance education students to engage with the content of a programming course, a more playful approach was introduced to the process of undertaking the course. Such approaches do accord with theories of motivation and of distance learning: they endeavour to engage the student in a dialogue with the course material and lecturer, seeking to give the student some confidence and limited autonomy in achieving goals together with their peers. However, such approaches are unlikely to be the panacea some may hope them to be (Deterding, 2012). Furthermore, they are not mature educational practices yet and it might be too early to write off their potential (Hung, 2017). Consequently, more work needs to be done to explore their value in higher education.

This study argues that the use of game elements in a playful approach to a programming course may have positive motivational effects. Even though it may not lead to increased participation in coursework, it does have very positive effects on student perception, appreciation, and experience of such a distance learning course. Where the aims are to provide a student who may have no other options to access higher education with a valuable learning experience, to counter some of the isolation problems experienced by such distance education students, and to provide the student with a sense of a caring lecturer, this approach may be worth considering.

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July – 2018

# Exploring Information Seeking Behavior of Farmers' in Information Related to Climate Change Adaptation Through ICT (CHAI)

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## Abstract

In Tanzania, agriculture sector is known for employing more than 70% of the total population. Agriculture sector faces many challenges including climate change. Climate change causes low productivity in agriculture; low productivity is caused due to poor implementation of agricultural policies and strategies. This poor implementation of policies has also caused many farmers to be not competent in climate change adaptation. Over the years, provisions of agricultural advice and extension were provided by various approaches, including training and visit extension, participatory approaches, and farmers' field schools. However, provision of agricultural advisory and extension service is inefficient. Also, in most cases the usage of most agricultural innovations and technologies developed is limited. A literature review indicates that the main reasons given by Tanzanian farmers for not using improved technology are not lack of knowledge or skill, but rather that the technologies do not contribute towards improvements (e.g., the technologies are not profitable or they imply to high risk). Thus, agricultural extension service needs to be geared towards teaching farmers how to develop innovative and cost effective technologies that are contextualized. Limited numbers of agricultural extension staff and less interactivity of Information and Communication Technologies (ICTs), such as radio and television, have been mentioned to be among the factors limiting the provision of agricultural advisory and extension services to the majority of farmers in Tanzania. The advancements in ICTs have brought new opportunities for enhancing access to agricultural advisory and extension service for climate change adaptation. In Tanzania, farmers and other actors access agricultural information from various sources such as agricultural extension workers and use of various databases from Internet Services Providers. Also there are different web – and mobile – based farmers' advisory information systems to support conventional agricultural extension service. These systems are producing bulk amounts of data which makes it difficult for different stakeholders to make an informed decision after data analysis. This calls for the need to develop a tool for data visualization in order to understand hidden patterns from massive data. In this study, a semi-automated text classification was developed to determine the frequently asked keywords from a web and mobile based farmers' advisory system called *UshauriKilimo* after being in use for more than 2 years by more than 700 farmers.

*Keywords:* agro-advisory service, climate change adaptation, information, needs, seeking, behaviour

## Background Information

Agriculture is the backbone of most African countries (Eicher, 2003; Havnevik Bryceson, Birgegård, Matondi, & Beyene, 2007; Salami, Kamara, & Brixiova, 2009; Lwoga, Ngulube, & Stilwell, 2011). In Tanzania, the sector is known for employing more than 70% of the total population, contributing about 25% to the Gross Domestic Product (GDP), bringing about 66% of the foreign exchange, and providing raw materials for local industries (United Republic of Tanzania [URT], 2008, Haug & Hella, 2013). The sector also feeds the nation and is the source of livelihoods to most rural communities in the country. However, agriculture is identified as one of the sector's most vulnerable to climate change (Mwandosya, Nyenzi, & Lubanga, 1998). This has led to difficulty in maintaining food security in most of the countries including Tanzania (Isinika, Hella, & Moshi, 2016; Haug, 2016). Food security is not only affected by climate change but also other factors including: lack of agricultural support services, weak research-extension-farmer linkages, among others (URT, 2008; Isinika et al., 2016). These factors hinder agricultural policies and strategies, which have been implemented over the years. Consequently, poor implementation of agricultural policies has resulted in rural and farming communities in the country failing to adapt to the impact of climate change. Ospina and Heeks (2010) argue that adaptation is the act of household, communities, regions, or nation to either tolerate, withstand, resist, or absorb the impact brought on by climate change. Examples of impacts that can be brought by the effect of climate change are food security, livelihoods, human settlement, and water supply (Ospina & Heeks, 2010).

Climate change is a threat to human societies and natural ecosystems, yet public opinion research finds that public awareness and concern vary greatly (Lee, Markowitz, Howe, Ko, & Leiserowitz, 2015; Haug, 2016). Shackleton, Ziervogel, Sallu, Gill, and Tschakert (2015) report that to enhance understanding of the process of climate change adaptation and to facilitate the planning and implementation of socially-just adaptation strategies, deeper consideration of the factors that impede adaptation is required. In response, scholars have done much research to identify barriers to adaptation of climate change (Upadhyay & Bijalwan, 2015). However, despite this progress, knowledge of barriers that hamper adaptation in developing countries remains limited, especially in relation to underlying causes of vulnerability and low adaptive capacity (Mutabazi, George, Dos Santos, & Felister, 2014; Mutabazi, Amjath-Babu, & Sieber, 2015). Adaptation goes hand-in-hand with awareness among farmers. One of the approaches used as an awareness technique to deliver climate change adaptation information is the conventional extension service (Tumbo et al., 2015).

The advancements in Information and Communication Technologies (ICTs) have brought a new opportunity for enhancing access to agricultural advisory and extension services (Upadhyay & Bijalwan, 2015). Empirical evidence from other developing countries like India, South Africa, and Ghana has shown that ICT have enhanced access to and usage of agricultural advisory and extension service (Aker, 2011; George et al., 2011). However, ICTs differ in terms of interactivity; thus, ICT can be categorized into traditional (less interactive) and modern (more interactive). The radio, television and the telephony are traditional ICTs most used in Tanzania (Mtega, 2012). Traditional ICTs are less interactive and in most cases they rarely enhance two-way traffic in the communication process, and when a feedback is made possible, it is not synchronous. Moreover, dissemination of agricultural information to farmers through traditional ICTs is always top-down in nature. Cole and Fernando (2012) describe top-down agricultural

information dissemination result in an inadequate diagnosis of the difficulties being faced by farmers as the channel used does not facilitate a feedback mechanism. Thus, conventional ICTs are not effective for the provision of agricultural advisory and extension services in some rural areas of Tanzania. Modern ICTs used in Tanzania as mentioned by Sanga, Phillip, Mlozi, Haug, and Tumbo, (2016) includes Internet, mobile phone applications, and ICT enabled agro-advisory systems. Modern ICTs are more interactive ICTs as they allow more collaboration and provisions for instant feedback from crowd. Studies in Tanzania show that among the modern ICTs, mobile phones are the most used (Mtega & Malekani, 2009; Mtega, 2012; Sife, Kiondo, & Lyimo-Macha, 2010; Sanga Phillip, Mlozi, Haug, & Tumbo, 2016).

According to the Tanzania Communication Regulatory Authority (TCRA) second quarterly statistics report of 2016, mobile phone infrastructure and the subscriptions to mobile phone services has grown exponentially over the past 10 years (Tanzania Communication Regulatory Authority [TCRA], 2016; TCRA, 2017). This has created an opportunity to use mobile phone services among most of Tanzania from both urban and rural areas. Moreover, TCRA (2016) shows that both the on and off net tariffs have been falling from the year 2005 to 2016 thus making mobile phone services more affordable to the majority in the country. The report showed that subscriptions to mobile networks reached more than 41 million subscriptions registered at the end of June 2017. In this period, more than 3.7 billion text messages (SMS) were used to communicate (TCRA, 2017). This is the evidence why system that supports communication via SMS was opted in this study.

The report<sup>i</sup> from workshop on *Improving Climate Services for Farmers in Africa and South Asia* identified challenges that hinder farmers from using climate services in different countries<sup>ii</sup>. The identified challenges from the report are as follows: traditional climate information is not well documented, there is a lack of accessibility to climate services, there exists ignorance or lack of knowledge on the availability of climate services, an absence of climate education is apparent, climate information not user friendly, there is lack of trust from farmers towards the service providers, at times the type of information is not reliable, there are inconsistencies in the information delivery, climate information is untimely communicated to farmers, channels of communications are not of the same quality depending on who is doing the communicating, when the communication occurs, and by what medium is used; language and technical understanding of the climate forecasts makes it problematic to interpret; there is a failure to analyze the benefits of climate information; there are poor linkages among actors along the value chains (e.g., between seed suppliers and farmers); there is a lack of sufficient capacity to make use of the information; climate information (especially the science-based) is mostly generalized and difficult to localize and access, and understanding of climate information (Tall et al., 2014).

Hence, there is no doubt that there is a need to enhance farmers access to advisory and extension service related to climate change adaptation using a blend of conventional methods, mobile phone applications, and other ICTs (Caine et al., 2015).

### **Significance of the Research Problem**

Agricultural advisory and extension services in Tanzania are ineffective partly because most of the generated knowledge and information aimed to improve agricultural production do not reach farmers

(Mkapa, 2005; URT, 2008). Also, farmers in Tanzania argue that the problem is due to lack of capital and labour. Furthermore, farmers cannot afford to take the risk and that farming is not necessarily profitable) (Haug, Hella, Nchimbi-Msolla, Mwaseba, & Synnevag, 2016; Haug, 2016). In most cases usage of developed agricultural innovations and technologies is limited due to limited number of agricultural extension staff with low access to agricultural information (United Republic of Tanzania [URT] 2011). Yet, there is fast growing ICT infrastructure in Tanzania in both rural and urban areas (TCRA, 2017). Several studies have shown that rural farmers in Tanzania have started using ICTs for accessing various services to support their farming (Sanga, Kalungwizi, & Msuya, 2013; Sanga, Mlozi, Tumbo, Mussa, Muhiche, & Haug., 2014; Churi, Mlozi, Mahoo, Tumbo, & Casmir, 2013; Mtega, 2012; Nyamba & Mlozi, 2012; Churi, Mlozi, Tumbo, & Casmir, 2012; Chilimo, 2008; Mtega & Malekani, 2009; Mushi & Nduye, 2012; Alhassan & Kwakwa, 2012). Despite of a number of researches in Tanzania, there are few studies that have been done related to research in developing tools for visualizing data in climate change adaptation (Sanga, Sumari, & Tumbo, 2013). Even though there is potential of ICT for agriculture in Tanzania, enabling farmers to access agriculture information on climate change adaptation has not been addressed well (Mushi & Nduye, 2012; Isinika et al., 2016).

Limited access to timely and accurate information has been identified as a major hindrance to enable farmers to get agriculture information on climate change adaptation (Ajayi et al., 2008). The evidence of this fact is that farmers have no reliable way of knowing when to plant their crops due to change of rainfall patterns (Mwalukasa, 2013). As such, farmers plant before it rains, which leads to destruction of seeds in the soil. Under such circumstances, this deprivation on the farmers could be greatly reduced if they had prior information regarding weather conditions. The forecast of weather need to be done using sophisticated technology since the rain patterns have changed and that the small rainy season has more or less disappeared in some placed (Haug, 2016).

In the light of the above, the Government of Tanzania has taken a number of steps to come up with different ICTs tools, including radio and television, through which farmers could access agricultural knowledge and information (Lwoga, 2010; Mushi & Nduye, 2012). However, there are some drawbacks with regard to the effectiveness of these tools in disseminating and communing climate change adaptation information. First, the broadcast media, such as television and radio, are expensive and most farmers cannot afford to buy them. Second, timing of the information is another problem. To access the information, farmers have to be listening or watching at the same time the programme is broadcasting (Mntambo, 2007). Hence, farmers are adopting mobile phones to access agricultural information which are cost effective, accessible, and cheap (Sanga, Mlozi, Haug, & Tumbo, 2016). Despite the fact that mobile phones-based applications are mostly used to enhance agricultural extension service but have brought a new challenge (Wyche & Steinfield, 2016). This challenge is caused by massive data which are generated (Keim, Kohlhammer, Ellis, & Mansmann, 2010). Thus, the massive data generated call for a need of developing a tool for data visualization. The aim is at helping farmers and other actors to make informed decision out of the user generated massive data. Content analysis using word or content cloud has been studied by many researchers (McNaught & Lam, 2010; Cidell, 2010) but its applicability in analysing massive (or big data) generated in ICT based agro-advisory service systems (with content in Swahili) is not adequately researched. This is the research gap which this study seeks to fill. Thus, the goal

of this paper is to evaluate information seeking behaviour / patterns of farmers who used *UshauriKilimo* for more than two years in consulting for advisories related to climate change adaptation.

This study tried to answer the following research questions:

1. What are the information needs of farmers in Tanzania who are using *UshauriKilimo* in advisory information related to climate change adaptation?
2. What are the information seeking behaviors of farmers in Tanzania who are using *UshauriKilimo* in advisory information related to climate change adaptation?

## Research Methodology

### Description of the Study Sites

The study was conducted in Kilosa District. Kilosa District has good ICTs infrastructure which enable access and use of mobile phones on various uses. Also, this District has been chosen due to high agricultural produce and high arable land for cultivation. In addition, the District is experiencing effect of climate change (Paavola, 2008; Mutabazi et al., 2014; Mutabazi et al., 2015).

### Research Design

The research adopted the qualitative research method. Specifically, content analysis was used to analyse the qualitative data which is found on *UshauriKilimo* server.

### Case Study of *UshauriKilimo*

*UshauriKilimo* was developed through participatory action research method (Sanga, Phillip, Mlozi, Haug, & Tumbo, 2016). It allows farmers and other actors to use their mobile phones to access agricultural information from researchers and extension workers (Sanga, Mlozi, Haug, & Tumbo, 2016). The agricultural information consists of different categories of information needed by farmers, including information related to adaptation of climate change. The stakeholders/actors who are using *UshauriKilimo* have been given capacity building for more than two years. The capacity building and empowerment activities were done through training and workshops. Also, there were visits by farmers from Dodoma Municipal in Dodoma and Kilolo District in Iringa to Kilosa farmers in Morogoro. Currently, there are more than 700 farmers who are using *UshauriKilimo*. The farmers who are using *UshauriKilimo* are producing massive data (i.e., big data) relating to different topics in agriculture including climate change.

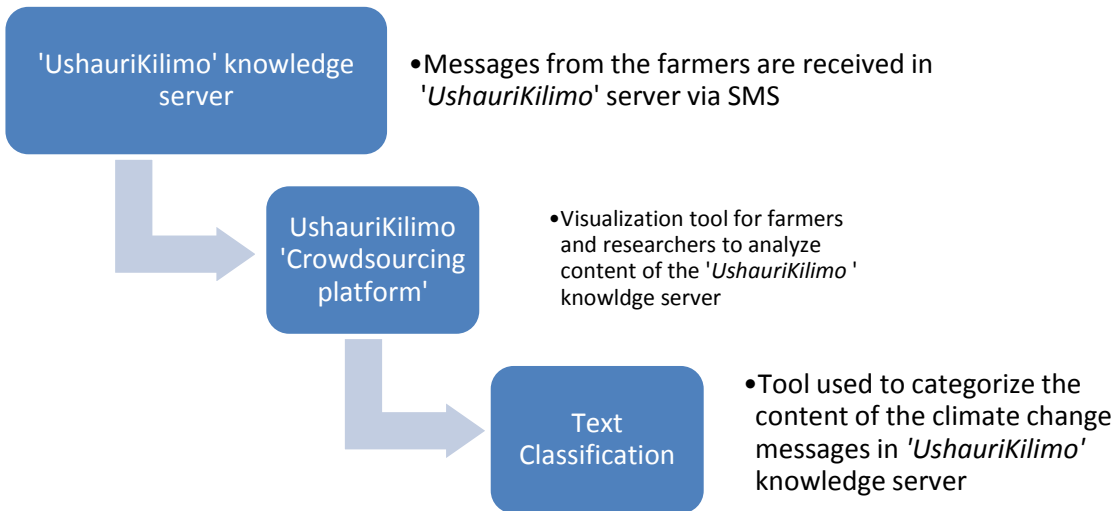


Figure 1. Data analysis process.

UshauriKilimo is a crowdsourcing platform which allows farmers and other actors (i.e., crowd) to engage in all phases of research process (Sanga, Phillip, Mlozi, Haug, & Tumbo, 2016). This act of engaging farmers and other actors in scientific investigation is called citizen science. Citizen science refers to the engagement of farmers and other actors (i.e., non-professional volunteers) in scientific investigations (i.e., by asking questions for needs, requirements assessment, or collecting data; developing software, evaluation of software, using the software, or interpreting results (Newman et al., 2012).

### Data Analysis

After massive data had been deposited in a crowdsourcing platform, the data mining tool was developed to help farmers search information using different keywords. The tool fetched data from the UshauriKilimo knowledge server (Figure 1). The results from the search were further subjected to data cleaning. The cleaned data were extracted to the data mining tool. The aim of this process was for recognizing a pattern of most frequent words (i.e., word visualization) from the corpus of a crowdsourcing platform.

In order to harvest data for this study, data from UshauriKilimo with keywords, such as climate or weather, were searched. Since the data in UshauriKilimo was in Swahili, the keyword that was used during searching was “hali ya hewa” (Table 1). After that had been collected, the data were analysed using a mixed methods approach (i.e., manual content analysis method and automated text classification, such as semi-automatic text classification).

Table 1

*Data Collection and Analysis*

Research approach	Type of data	Source of data	Data analysis
Qualitative	data found on <a href="http://www.ushaurikilimo.org">www.ushaurikilimo.org</a>	Questions and answers from farmers, extension agents, and other actors in the value chain related to climate change issues	Content analysis

## Results and Discussion

A simple search in a crowdsourcing platform using the keyword “hali ya hewa” (Swahili word for weather and climate), 22 questions and answers were obtained (Figure 2).

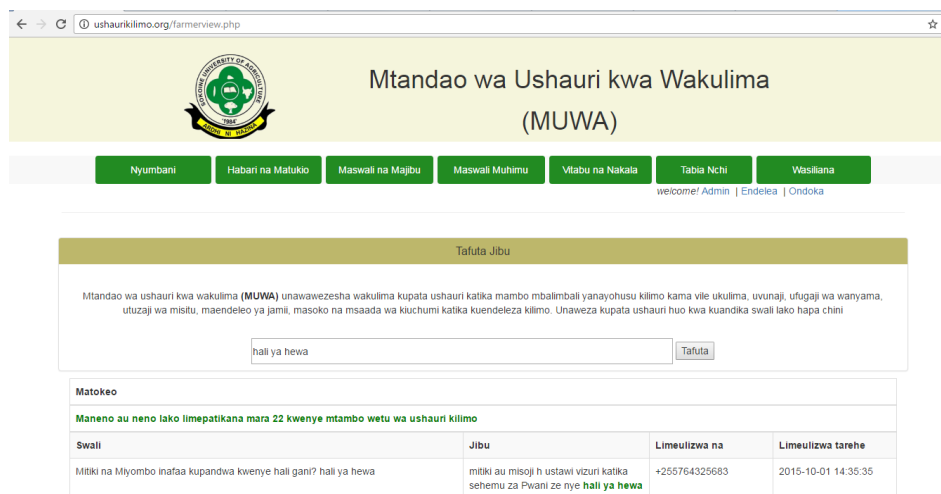


Figure 2. Search interface for the system.

Then all 22 statements containing questions and answers were cleaned to remove mobile phone numbers of farmers who asked questions and the dates when the questions were asked. After this data cleaning process, 1148 words were extracted (Figure 3).







2009; Berlanga, Van Rosmalen, Boshuizen, & Sloep, 2012). In our case study, we developed a decision support system (DSS) for data visualization. Also, data visualization was done using Wordle and TagCrowd tools. Furthermore, Statistical Package for Social Sciences (SPSS) was used to do additional analysis. This was done by compiling SPSS template with the data related to climate/weather, drought, and irrigation keywords in the questions asked by farmers using their mobile phones. The key words “Hali ya hewa,” “ukame,” and “umwagiliaji” were used to capture questions on climate change asked by farmers. There were 38 questions and answers related to these three keywords. Table 2 shows the date when the questions were asked, frequency, percentage, and the cumulative frequency (Table 2).

Table 2

*Frequency of Questions Asked With Either Climate/Weather, Drought, or Irrigation Keywords*

		Frequency	Percent	Cumulative percent
Valid	2015-05-09T00:00:00.000	1	2.6	2.6
	2015-05-25T00:00:00.000	1	2.6	5.3
	2015-06-07T00:00:00.000	1	2.6	7.9
	2015-07-06T00:00:00.000	1	2.6	10.5
	2015-07-08T00:00:00.000	1	2.6	13.2
	2015-07-11T00:00:00.000	1	2.6	15.8
	2015-07-21T00:00:00.000	1	2.6	18.4
	2015-08-06T00:00:00.000	1	2.6	21.1
	2015-08-09T00:00:00.000	1	2.6	23.7
	2015-08-10T00:00:00.000	1	2.6	26.3
	2015-08-14T00:00:00.000	1	2.6	28.9
	2015-08-26T00:00:00.000	1	2.6	31.6
	2015-09-11T00:00:00.000	2	5.3	36.8
	2015-09-13T00:00:00.000	1	2.6	39.5
	2015-09-29T00:00:00.000	1	2.6	42.1
	2015-10-01T00:00:00.000	1	2.6	44.7
	2015-10-08T00:00:00.000	1	2.6	47.4
	2015-11-01T00:00:00.000	1	2.6	50.0
	2016-02-13T00:00:00.000	1	2.6	52.6
	2016-02-18T00:00:00.000	1	2.6	55.3

2016-02-19T00:00:00.000	1	2.6	57.9
2016-04-27T00:00:00.000	1	2.6	60.5
2016-04-28T00:00:00.000	1	2.6	63.2
2016-05-02T00:00:00.000	1	2.6	65.8
2016-05-12T00:00:00.000	1	2.6	68.4
2016-05-25T00:00:00.000	1	2.6	71.1
2016-06-08T00:00:00.000	1	2.6	73.7
2016-06-27T00:00:00.000	1	2.6	76.3
2016-07-05T00:00:00.000	1	2.6	78.9
2016-08-03T00:00:00.000	2	5.3	84.2
2016-09-09T00:00:00.000	1	2.6	86.8
2016-10-05T00:00:00.000	2	5.3	92.1
2016-10-12T00:00:00.000	1	2.6	94.7
2016-10-26T00:00:00.000	1	2.6	97.4
2016-11-01T00:00:00.000	1	2.6	100.0
Total	38	100.0	

Table 2 shows that farmers asked many questions between June and November of each year (i.e., 2015 and 2016). Also, Table 2 shows that even though farmers have been asking questions relating to other problems in agriculture, issues concerning climate change are also included (Sanga, Phillip, Mlozi, Haug, & Tumbo, 2016). In total, there are 1739 questions in UshauriKilimo (Fue et al., 2017). Data from UshauriKilimo indicate that the questions, which came from farmers asking about other issues and not those related to climate change, totalled 1701 questions. There were 605 questions and answers related to livestock husbandry (Fue et al., 2017), and 63 questions and answers related to markets and market information, posted on UshauriKilimo. Furthermore, there were 427 questions and answers related to forestry information. This means that questions and answers related to crops totalled 605. Figure 6 shows how farmers perceive climate change to be in regards to other challenges they are facing (e.g., marketing, prices, inputs, etc.).

Type of information need	Number of questions and answers	Percentage
Climate change	22	1.27
Livestock husbandry	605	34.79
Markets / market information	63	3.62
Forestry	427	24.55
Crop farming	622	35.77
Total	1739	100

Figure 6. General information needs and seeking behaviour of farmers using Ushaurikilimo.

Thus, UshauriKilimo is linking farmers, researchers, and extension agents for communication of agriculture information related to a number of topics including climate change (Sanga, Mlozi, Haug, & Tumbo, 2016). Not all farmers in Kilosa District are aware of Ushaurikilimo, a system that can help in information sharing in climate change issues. Climate change is a great threat to agricultural production in Tanzania and there is a need to scale up this system so that its potential can benefit a large number of farmers and other actors. Since only 22 questions out of 1739 asked were related to climate change, this means that most of the farmers are unaware of climate change. Awareness programs are required to sensitize farmers on information related to climate change adaptation. Also, climate change adaptation information is required to cope with climate change (Haug, 2012; Haug, 2016). Milder, Majanen, and Scherr (2016) found that despite the environmental, economic, and social benefits to climate change adaptation techniques, adoption was sparse. They recommended that in order to facilitate the adoption of climate change adaptation information, there is a need for intensive education, policy changes, and infrastructure development (Nambiza, 2014). These suggestions concur with Elia, Mutula, and Stilwell (2015) who advocated for repackaging of current and accurate information on climate change and variability, farmer education and training, collaboration between researchers, meteorology experts, extension officers and farmers, as well as formulation of a framework for the dissemination of information related to climate change adaptation. In this respect, UshauriKilimo has been successfully used to disseminate extension services to more than 700 farmers in Tanzania via mobile phones and the web (Sanga, Phillip, Mlozi, Haug, & Tumbo, 2016). There are more than 1300 questions and answers that have been given to farmers by extension agents. Among the advisories given in UshauriKilimo, the different coping strategies for climate change adaptation include, use of drought resistant varieties for maize, use of sacks for post-harvest storage, use of drip irrigation, adjusting planting dates, and early warning communication system for planting dates and weather forecast. These coping strategies have also been advocated in other countries, such as Ethiopia, which have been experiencing effects of climate change (Mengistu, 2011; Ospina & Heeks, 2011). Mengistu (2011) argues that there is need for early warning system to disseminate climate change coping strategies to farmers and other actors. Such systems will complement the indigenous knowledge that is already being in used by farmers in developing countries (Elia, Mutula, & Stilwell, 2014).

Furthermore, findings show that UshauriKilimo is offering advisories to farmers who seek information related to climate change adaptation. The information seeking behaviour of farmers ranges from using improved seed, mulching, intercropping, as well as doing various on farm practices like keeping local chicken, bee keeping, and aquaculture (i.e., integrated agriculture). Also, crop diversification is being practiced by farmers and this has helped to increase farmers' yields and replenishing soil nutrients. In addition, farmers are adopting drought tolerant crops (e.g., cassava, maize, sorghum, and millet). Home gardens, kitchen gardens, or sack gardens are also been practiced in Kilosa District. Furthermore, system of rice intensification technology that uses a minimal amount of water is being practiced by a few farmers in Kilosa. These findings concur with earlier studies that were done in Kilosa (Paavola, 2008; Mutabazi et al., 2014,).

Furthermore, farmers sought information about floods after it has occurred in 2016. The extension agent advised the farmer to farm crops that can yield in short periods of time (Figure 7).

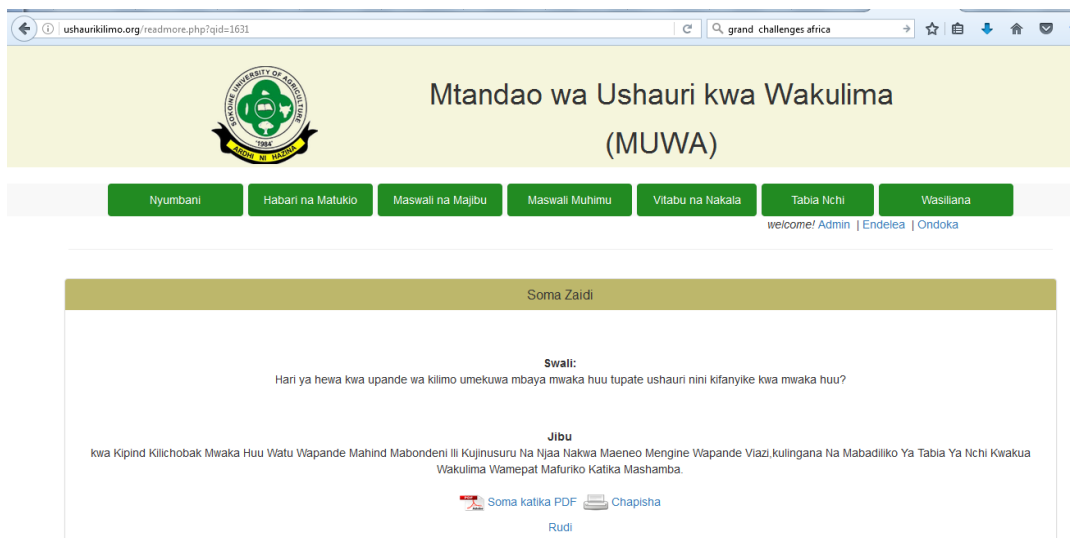


Figure 7. Advice from extension agent about what to farm after flooding has occurred in Kilosa.

The results reported in this study showed that farmers identify problems while they were doing different agriculture activities and then extension agents and researchers gain awareness of those problems troubling farmers resulting in the establishment of a dialogue via mobile phones (i.e., UshauriKilimo). The purpose was for extension agents and researchers to influence behavioural change of farmers with respect to climate change adaptation strategies (Harvey et al., 2012). This was achieved through a participatory action research approach (PARA) in a multiple loop of learning to obtain the intended outcomes (Armitage, Marschke, & Plummer, 2008). Therefore, this study responds to the recommendation made by Mushi and Nduye (2012) who advocated the need for implementation of an early warning system to share issues related to climate change.

## Conclusion

Previous studies indicate that farmers in Kilosa District are experiencing delayed onset of rains, poor rainfall distribution over the cropping season, and extreme weather conditions, such as droughts and floods (Paavola, 2008; Mutabazi et al., 2014.). These effects of climate changes, affect farmers in their farming activities. Most farmers in the Kilosa District have limited access to technologies, resources, and extension services. Thus, these challenges leave these farmers more vulnerable to climate change than those with more resources. Despite these challenges, agricultural activities remain the main source of livelihood for smallholder farmers in Kilosa District. The conventional way of using extension agents, on which farmers largely depend on, is no longer sufficient to help farmers obtain information related to climate change adaptation. The aim of developing UshauriKilimo was to link farmers, researchers, and extension agents in communicating agricultural information and knowledge (Sanga, Mlozi, Haug, & Tumbo, 2016). From this study, we have found that farmers share agriculture information related to coping strategies for climate change adaptation. Already, massive data is being deposited into the UshauriKilimo database. This study presents results from the data visualization tool, which was used in determining the pattern of information seeking behaviour of farmers in relation to climate change adaptation. The findings from the developed data visualization tool were compared to the results obtained from the content analysis, Wordle and TagCrowd tools. Furthermore, the results from Wordle and TagCrowd tools were compared to the results from an analysis done using Statistical Package for the Social Sciences (SPSS).

One may ask “Does the information seeking behaviour of farmers differ when it comes to acquiring climate change adaptation information compared to acquiring other types of farming related information?” From this study finding, one can deduce that farmers asked how to mitigate impacts of climate change after it had occurred. This is different compared to the information seeking behaviour of farmers in other types of farming (Sanga, Phillip, Mlozi, Haug, & Tumbo, 2016; Fue et al., 2017). Also, this study indicates that farmers seek information about climate change adaptation from not only farmers' friends and neighbours, extension agents, TV, radio, mobile phones, and mass and print media, but also from other sources of information like the Internet, web, and mobile apps. This blended way of provision of extension services is different from earlier studies (Mwalukasa, 2013). This paper has shown that UshauriKilimo supported the demand-led and personalized/client-based extension service in order to meet the farmers' needs in seeking information related to climate change adaptation. We have shown new ways to communicate climate change adaptation information which is different from the supply driven and top-down approach that is being done by many organizations<sup>iii</sup>.

The authors recommend a future study on determining the pattern of information from UshauriKilimo using an artificial intelligence algorithm for text classification.

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i <http://scalingup.iri.columbia.edu/>

ii <http://impact.ref.ac.uk/casestudies2/refservice.svc/GetCaseStudyPDF/39121>

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July – 2018

## Eight Patterns of Open Textbook Adoption in British Columbia



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### Abstract

Since the launch of the BC Open Textbook Project in 2012, the adoption of open textbooks has steadily grown within public post-secondary institutions in British Columbia, Canada. An analysis of adoption records over a five-year period reveals that open textbooks have been adopted across all types of institutions, including research universities, teaching universities, colleges, and institutes, and across a diverse set of disciplines, with the largest numbers in the sciences and social sciences. In this report we identify, describe, and illustrate eight distinct patterns of open textbook adoption. These are: stealth adoption, adoption by infection, committee adoption, sanctioned exceptional adoption, course developer adoption, infection by inter-institutional carrier, creation and adoption, and lone adoption. While these patterns are not intended to be exhaustive, we hope that identifying these patterns provides a useful framework for campus leaders to (a) understand how adoptions occur in their own contexts, (b) identify ways to support further adoptions, (c) recognize that there are multiple ways, and no single path, to supporting the adoption of educational innovations at their institutions, and (d) foster the embrace of wider open educational practices.

*Keywords:* open educational resources, open textbooks, higher education, British Columbia, Canada

## Introduction

The high cost of commercial textbooks has strengthened the existing relationship between socioeconomic status and academic achievement (Sirin, 2005), with a majority of post-secondary students in British Columbia not purchasing at least one of their required textbooks due to cost (Jhangiani & Jhangiani, 2017; Hendricks, Reinsberg, & Rieger, 2017). Moreover, a significant minority of BC students are enrolling in fewer courses, not registering for specific courses, and even withdrawing from courses, once again citing high textbook costs (Jhangiani & Jhangiani, 2017). This, together with a desire on the part of faculty for greater pedagogical flexibility has led to a rapid growth in the creation, adaptation, and adoption of open textbooks, a type of open educational resource (OER) that is free for users to reuse, revise, remix, retain, and redistribute (Wiley, Bliss, & McEwen, 2014).

Within Canada, the open textbook movement has been led from within the Province of British Columbia (BC) where, thanks to support from the Ministry of Advanced Education, the BC Open Textbook Project was launched in 2012. The initial goal of this project was to harvest, adapt, or create open textbooks for the 40 highest-enrolled undergraduate courses in the Province, with additional funding later provided for open textbooks for trades, technology, and skills training (BCcampus, n.d.). Five years later, there are now over 220 open textbooks available in the BC repository (see [open.bccampus.ca](http://open.bccampus.ca)), for subjects as wide-ranging as History, Physics, Psychology, Adult Literacy, Tourism, and Common Core Trades. As of December 2017, these textbooks have been adopted by over 400 faculty across 42 BC institutions in more than 1650 course sections, with an estimated total savings to students of over \$5.5 million (BCcampus, 2017). In addition to these significant cost savings, BC students assigned OER have been shown to perform the same as *or better than* those assigned commercial textbooks (Hendricks et al., 2017; Jhangiani, Dastur, LeGrand, & Penner, in press), a consistent finding in the research literature (Hilton, 2016).

A BCcampus-sponsored survey of 78 BC educators using OER aimed at better understanding their experiences, perceptions, barriers, and enabling factors revealed similar patterns of OER adoption across research universities, teaching universities, colleges, and institutes (Jhangiani, Pitt, Hendricks, Key, & Lalonde, 2016). Consistent with previous studies (Hilton, 2016), a majority of these educators rated the quality of the OER they used as comparable, slightly better, or significantly better than traditional, proprietary materials. The most significant barriers to using OER identified by this sample concerned discoverability, time, and a lack of support. On the other hand, the availability of relevant, high-quality, and easy-to-use OER and a personal recommendation were listed among the top factors that facilitate the adoption of OER.

However, although earlier studies provided a snapshot of OER adoption across the Province's public post-secondary institutions, OER adoption is not a homogenous experience. While some faculty may be early adopters and discover and use OER independently, we suspected that faculty members come to use OER in a multitude of ways. Therefore, a need remains to better understand the different pathways to OER adoption. By understanding how faculty come to adopt OER, the community, individuals, and institutions advocating for open practices will gain an understanding of the ways that OER infuse into practice, and will therefore be better able to impact practice. Furthermore, such knowledge will enable those advocating for OER to explore different models of OER diffusion, and thus investigate alternative ways of impacting practice.

## Research Process

The BCcampus open textbook adoption records provided an archival research opportunity to fulfill this objective. The BCcampus open textbook adoption records consist of voluntary self-reported data from adopting faculty or institutions. In particular, BCcampus invites faculty in the province to submit information pertaining to open textbook adoptions, such as textbook adopted, textbook displaced, discipline, course enrolment, etc. While such data should be recognized for their limitations, the impact of such self-reported data on this study is expected to be minimal. This is because this study seeks to examine ways that OER are adopted, as opposed to investigating the accuracy of reported impacts of open textbook adoptions or the degree of OER use in the province.

By conducting a longitudinal analysis of open textbook adoption frequencies (separated by institution, discipline, and instructor) we have unearthed eight distinct patterns of adoption. While these patterns are not intended to be an exhaustive list (e.g., there may very well be additional patterns in different contexts that were not evident within the BCcampus dataset), we hope that identifying these patterns provides a useful framework for campus leaders (e.g., administrators, faculty, OER working groups, open education advocates) to (a) understand how adoptions occur in their own contexts, (b) identify ways to support further adoptions, (c) recognize that there are multiple ways, and no single path, to supporting the adoption of educational innovations at their institutions, and (d) foster the embrace of wider open educational practices including the adaptation and creation of OER as well as open pedagogy.

## Open Textbook Adoption Patterns

The data reveal that open textbooks have been adopted across diverse disciplines, with the largest numbers of adoptions in BC occurring in the Sciences and Social Sciences (Figure 1). These discipline-based adoption patterns are likely a function of the high cost of commercial textbooks in these disciplines, the availability of open textbooks for specific courses, and BCcampus' focused campaign to support the adoption of open textbooks in the highest-enrolled courses in BC.



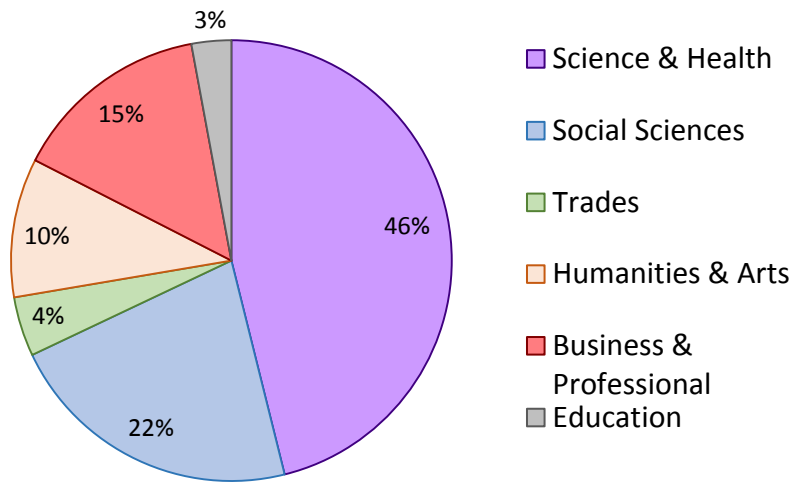


Figure 1. Open textbook adoptions by discipline.

As can be seen in Figure 2, the share of open textbook adoptions by the type of institution corresponds somewhat to the number of public institutions in the four categories (11 colleges, 6 research universities, 4 teaching universities, and 3 institutes; see Appendix), with only research universities under-represented. Regardless of institution type, the modal adoption trend over time is a steady increase in open textbook adoptions, such that once open textbooks are introduced to an institution or faculty, they seem to become more widespread there (Figure 3).

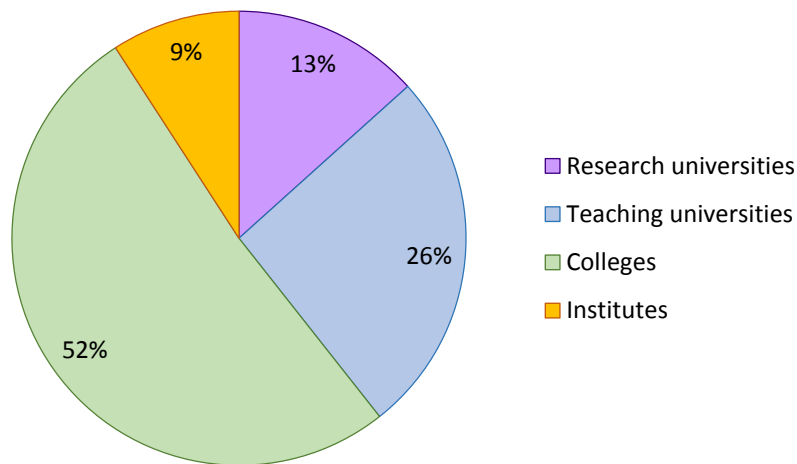


Figure 2. Open textbook adoptions by type of institution.

Eight Patterns of Open Textbook Adoption in British Columbia  
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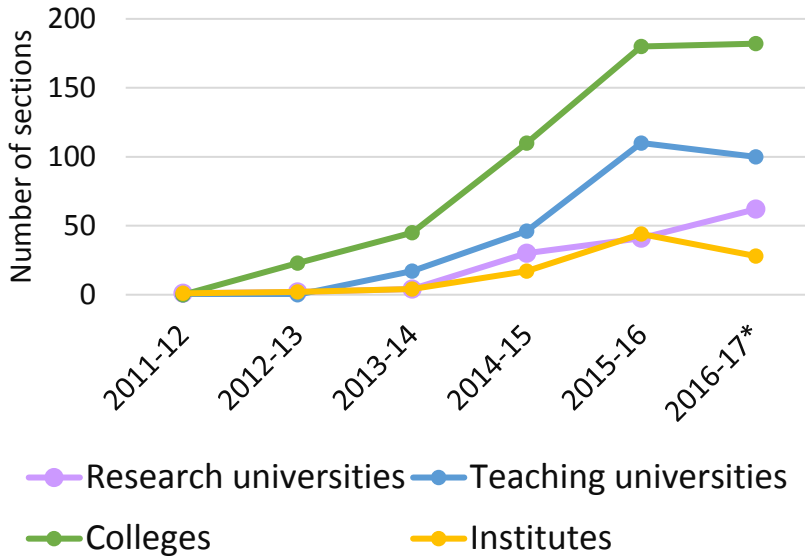


Figure 3. Open textbook adoptions by academic year by type of institution. Adoption data from 2016-17 does not include Summer 2017 sections.

After organizing and analyzing the self-reported adoptions of open textbooks in BC from Fall 2011 to Spring 2017, we sought to describe how exposure translates to adoption by describing apparent patterns of adoption within an institution or program. We identified eight patterns. Recognizing adoption patterns and attempting to predict which adoption pattern may be most relevant to a given institution or department can be a first step to predicting what exposure strategies (internal or external grants, honoraria for faculty reviews, guest speakers, professional development opportunities, internal advocacy, etc.) might be most effective in encouraging the adoption, adaptation, and development of additional open textbooks in BC.

### Adoption Pattern 1: Stealth Adoption

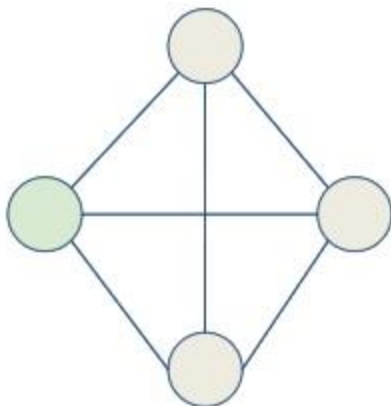


Figure 4. Visual representation of a stealth adoption.

Stealth adoption refers to the instance in which open textbook adoption is invisible to individuals beyond those adopting the textbook. As student advocacy groups work to increase visibility of open educational resources, students who, for example, cannot afford to purchase a textbook for their course may hear about these resources from other students and choose to use them instead of purchasing an officially required textbook, potentially without their instructor's knowledge. In other cases, such as the use of the *OpenStax Anatomy & Physiology* textbook at Douglas College, instructors officially listed an open textbook with their campus bookstore, but as a "supplementary" and/or "optional" resource rather than the one required textbook for a course. As a result we suspect that the officially-reported number of open textbook adoptions in BC postsecondary institutions is likely lower than the actual usage rates. Some instructors may have recommended an open textbook to their students without necessarily listing it as an officially required resource for the course or may have adopted one without reporting it to BCcampus, or students may have adopted open textbooks in lieu of the non-open textbooks required by instructors. These uses of open textbooks are not currently captured in BCcampus' official listings of adoptions, which include only those open textbooks adopted as the required textbook for a given course. "Stealth adoptions" such as these result in the officially-reported numbers of open textbook adoptions being lower than actual usage rates of these resources.

### Adoption Pattern 2: Infection

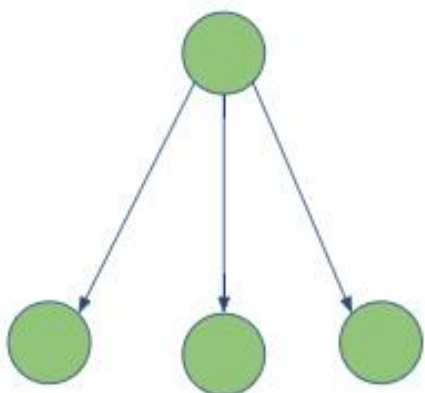
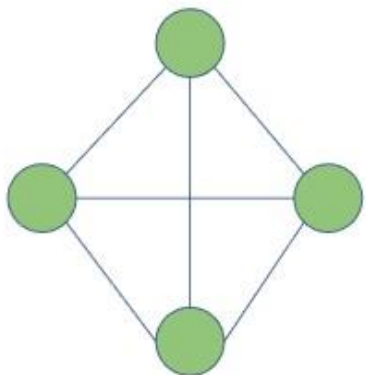


Figure 5. Visual representation of adoption by infection.

In several cases, the reported adoptions from a given institution show a rather distinct pattern wherein one instructor adopts an open textbook for their course for one or two semesters, and then other instructors within the same department report adoptions in subsequent semesters. We called this type of adoption an "infection." In such cases, it seems that a single instructor heard of open textbooks and was willing to try one out and then, being pleased with the results, went on to recommend open textbooks to their colleagues. For example, within the Physics department at Douglas College a single open textbook "champion" piloted the adoption of an open textbook and subsequently encouraged other instructors in physics to try an open textbook in their own classes. Once the instructors had a chance to witness the benefits of using an open textbook in action, they then opted to adopt it permanently; however, they were very unlikely to have tried it in the first place were it not for the encouragement of a vocal champion in their department.

### Adoption Pattern 3: Committee Adoption



*Figure 6.* Visual representation of committee adoption.

Committee adoption refers to those cases in which committees, rather than individual instructors, collaborate on the design and development of courses and curricula and adopt open textbooks. This is often the case with introductory-level survey courses that are taught by multiple instructors. Interestingly, in such cases, this standardization is often motivated by a desire to save students money so that, for example, a student who needs or wishes to retake a course with a different instructor will not be required to purchase a second textbook. When a course committee decides to adopt an open textbook for a large survey course, there is naturally a marked increase in the number of instructors reporting adoptions for that course in a single semester. As a result of the high number of sections of such courses, many instructors and many students can thus all be exposed to an open textbook for the first time. The data suggest that although committees may in some cases be slow to adopt an open textbook, they are also reluctant to switch back once the change has been made, as such sudden and large-scale adoptions seem to persist through multiple semesters. A unique case of committee adoption occurs at Royal Roads University. The MA in Learning and Technology program has been redesigned with openness as a core value, and each course in the program is being designed by teams of at least two faculty who serve as the committee for that course. This team selects course readings, identifying open resources first and foremost where available and pedagogically prudent, including open textbooks such as Bates (2015). Thus, as courses are developed, open resources are infused into the design of courses from the beginning, making them integral components of the course experience. It is important to highlight here the potential overlaps between this pattern and other types of adoption. For instance, an open textbook champion that “infects” others with their advocacy may sit on a course development committee.

### Adoption Pattern 4: Sanctioned Exceptional Adoption

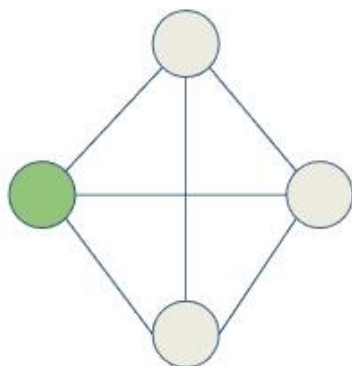
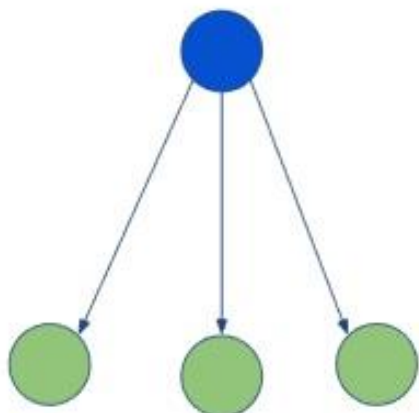


Figure 7. Visual representation of sanctioned exceptional adoption.

A twist on Committee Adoption, sanctioned exceptional adoption reflects those committee-adoption contexts in which support for the adoption of an open textbook is not supported by a majority of the committee or department. In one such case in BC – the Psychology Department at Kwantlen Polytechnic University (KPU) – several vocal OER advocates banded together and requested departmental permission to adopt an open textbook for the two Introductory Psychology courses for a period of one year (while the rest of the department continued adopting the incumbent standardized commercial textbook). Over that year, the instructors investigated the impact of open vs. commercial textbook adoption on student outcomes (e.g., exam performance, study habits, etc.). At the end of the year, the instructors presented their findings to their colleagues, which showed that KPU Psychology students assigned an open textbook performed the same as or better than those assigned the commercial textbook (Jhangiani et al., in press). Although the results of their investigation did not sway the majority of the department to switch to the open textbook, an ongoing sanctioned exceptional adoption was approved, such that *any* future KPU Psychology instructor of Introductory Psychology would be free to adopt an open textbook. This *exceptional adoption* approach does not require course-wide standardization of open textbook adoption.

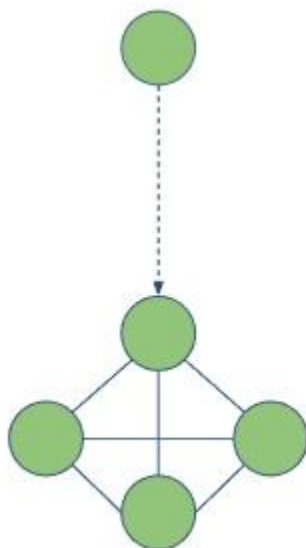
## Adoption Pattern 5: Course Developer Adoption



*Figure 8.* Visual representation of course developer adoption.

Course developer adoption refers to the cases where course developers familiar with the OER movement advocate for, support, and influence the adoption of open textbooks in new or revised course offerings. In many cases, instructional designers, who are experts in designing learning experiences, support such adoptions through consulting with, advising, supporting, and mentoring faculty and faculty course developers. This is one reason why the Open Education Group recently announced an open education fellowship program for instructional designers (“Designing with OER (DOER) Fellows,” n.d.). Although many institutions in BC employ instructional designers, only two strive to ensure that every course is supported by an instructional designer: Thompson Rivers University, Open Learning (TRU-OL) and Royal Roads University. For example, at TRU-OL, instructional designers supported faculty course developers in the redesign of a Research Methods in Psychology course in order to integrate an open textbook (Price, Jhangiani, & Chiang, 2015) and build other courseware around it in a way that capitalized on the affordances of open practices.

### Adoption Pattern 6: Inter-Institutional Carrier Infection



*Figure 9.* Visual representation of adoption by inter-institutional carrier infection.

An interesting adoption pattern that became apparent as we sorted through the data was a kind of “cross-pollination” occurring between institutions. In these cases, an individual who possessed experience with open textbooks or was already a champion for open education brought that enthusiasm with them to a new institution. These individuals include contingent faculty who teach at multiple institutions and full-time faculty who move from one institution to another. As an example, Charles Hooge, an instructor who was an advocate for open textbooks at Capilano University, brought that enthusiasm to the British Columbia Institute of Technology (BCIT), immediately putting forward a proposal to begin editing an OpenStax College Physics textbook. In such cases, because the original adopter already has experience with open textbooks, there is the possibility of rapid adoption and a sudden increase of open textbook adoptions at their new institution. Anecdotally, we discovered that these champions also often become advocates, joining cross-functional OER working groups to continue to spread the word.

### Adoption Pattern 7: Creation and Adoption

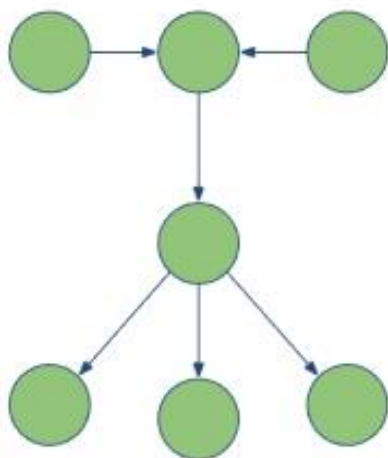


Figure 10. Visual representation of creation and adoption.

One of the most powerful ways for educators to gain experience with open resources is when they themselves create those resources. The data revealed a number of situations where particular institutions or programs recruited faculty to help write a new open textbook which was then published through BCcampus' Open Textbook Project. In some cases, the faculty members were not familiar with the open publishing model to begin with, but once on-board, they became enthusiastic advocates. Examples of this model in action include the open textbooks [Graphic Design and Print Production Fundamentals](#) and [Clinical Procedures for Safer Patient Care](#), both created at BCIT. Both of these textbooks filled a gap that other open educational resources did not cover. The need for the material was thus already there and only required the support of the open education community to get these projects started.

### Adoption Pattern 8: Lone Adoption

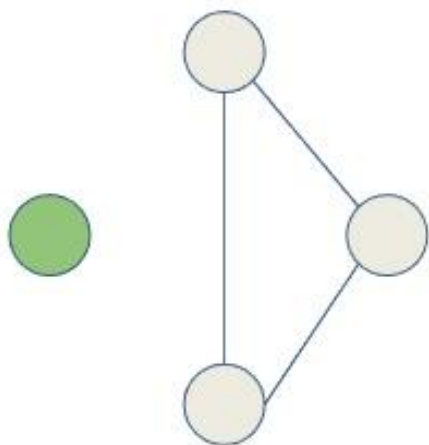


Figure 11. Visual representation of lone adoption.



The data revealed several apparent outliers, wherein textbook adoptions in some departments presented as a single point recurring one term after the other (sometimes over years) without expanding within those departments. These data points represent faculty members who adopt an open textbook and continue to use it, semester after semester, with significant time passing before the adoption of that textbook spreads to the faculty member's departmental colleagues. These "lone adopters" were persistent, and while they likely weren't keeping it a secret, for any number of reasons there were barriers to the uptake of the same open textbook by other faculty members. Unfortunately, the data do not reveal what those barriers to more widespread adoption might have been, whether a non-receptive department or simply a challenge convincing colleagues of the benefits of open educational resources. While there are several anecdotal stories of this type of adoption, it will be useful to collect more data about this particular adoption trend so as to determine the factors that could lead to future wider adoptions within the department of a lone adopter, and thus where advocacy efforts may be best applied.

## Discussion

The eight patterns identified above shed light on some of the heterogeneous contexts in which OER are adopted, information that will hopefully prove useful to those seeking to encourage more widespread adoption of OER within their institution or system. For example, where stealth or lone adopters can be adequately and visibly supported, infection adoptions may well follow. Where there is less than a critical mass of grassroots engagement with OER, the sponsorship of an OER creation project may lay the foundation to build such a community. Alternatively, where individual instructors who wish to adopt OER are constrained by the collective will of a textbook selection committee, a sanctioned exceptional adoption might be offered as a strategy.

Of course, this descriptive analysis was not intended to capture all possible pathways. We encourage researchers and practitioners to assess the applicability of these patterns and, where necessary or useful, to add to or modify the set. As noted above, the BCcampus open textbook records are based on self-reports by faculty or other institutional representatives. This method of gathering data erects obvious hurdles in that open textbook adopters, at a minimum, need to be aware of the existence of the online adoption reporting form and sufficiently motivated to complete it periodically. However, even when these conditions are satisfied, individual educators may operationalize the term "adoption" differently (e.g., primary required course resource vs. optional supplementary resource) and they may yet not use the form to report stealth adoptions or the adoption of open textbooks or other OER that are not held in the BCcampus repository. All of this suggests the need for the development of a better mechanism to collect more accurate data that provides a complete picture of OER adoption within each institution within the BC post-secondary system. Such data may be easily accessible within departments or institutions. For instance, given that department heads or directors have access to all syllabi used within their department or school, a text parser could be developed to identify course readings and resources that could then be identified as constituting (or not) an OER. Such analyses could be run yearly, identifying patterns of adoption over time.

Another possible mechanism may be through the establishment of OER working groups, which have emerged at several BC post-secondary institutions. These groups typically work to raise awareness of OER,

provide workshops and other opportunities for training, adjudicate grants to support the creation of adaptation of OER, and even plan programs that carry a \$0 textbook cost in all the courses required to earn a particular credential (often referred to as Zed Cred programs). Given the nature of their work and their greater proximity to practitioners, it seems obvious that OER working groups could play a crucial role in gathering or verifying the data summarized here. After all, accurate records of OER adoption are essential to both planning the kinds of support that are needed as well as assessing the impact of an institutional OER initiative. As researchers and advocates for OER, we hope that the identification of the eight OER adoption patterns in this report help illuminate various paths forward for both practitioners and researchers.

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## Appendix

### Public Post-Secondary Institutions in British Columbia

<u>Colleges</u>	<u>Research universities</u>	<u>Teaching universities</u>	<u>Institutes</u>
Camosun College	Royal Roads University	Capilano University	British Columbia Institute of Technology
College of New Caledonia	Simon Fraser University	Emily Carr University of Art and Design <sup>a</sup>	Justice Institute of British Columbia
College of the Rockies	Thompson Rivers University	Kwantlen Polytechnic University	Nicola Valley Institute of Technology
Douglas College	University of British Columbia	Vancouver Island University	
Langara College	University of Northern British Columbia	University of the Fraser Valley	
North Island College	University of Victoria		
Northern Lights College			
Northwest Community College			
Okanagan College			
Selkirk College			
Vancouver Community College			

<sup>a</sup>Excluded from the present study due to zero reported open textbook adoptions during the specified period.



July – 2018

## Open and Distance Learning in French-Speaking Sub-Saharan Africa: A Literature Review

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### Abstract

This article is a literature review on open distance learnings (ODL) in Francophone Sub-Saharan Africa (FSSA). The state of research on this question highlights many topics, such as the supporting reasons for the creation of ODL systems and their potentials. Success, difficulties, and issues linked to their implementation also hold a crucial place in this research. Besides, this literature review shows that studies on ODLs in FSSA emphasize the representations, motivations, and identities of students and university managers, including the historical and cooperative aspects of these third-generation learnings. While most of the research in this field are descriptive or exploratory, others are critical. Beyond these results, research must further explore many perspectives, mainly those related to teaching and learning practices, evaluation, social and university transformations, and the hybrid forms of learning.

*Keywords:* ODL, French-speaking Sub-Saharan Africa, literature review, research statement, African virtual university, francophone university agency

## Introduction

As Depover and Orivel (2012) and Loiret (2013a) point out in their studies, Open and Distance Learnings (ODL) have been developing since the latter half of the 1990s in French-speaking Sub-Saharan Africa (FSSA). Karsenti and Collin (2013) also note that States and universities in this part of Africa are interested in promoting these third-generation learning systems, despite their technical, socio-economic, and pedagogical deficits. If the early development of distance learnings in Africa involved only a few academic institutions such as the African Virtual University, Cheikh Anta Diop University of Dakar, the University Institute of Technology in Bandjoun, and the National Center for Tele-education of Madagascar; however, today close to hundred ODL systems exist. These training programs include local institutional initiatives as well as cooperative projects. The African Virtual University, the *Agence Universitaire de la Francophonie* and those conducted by Indian universities through the Pan African e-Network Project, are part of these international programs, thus increasing the number of ODL initiatives.

At the Agence Universitaire de la Francophonie alone, 25% of ODL offered in 2015 around the world, are with African universities, which makes Africa its priority field regarding the development of these programs (Depover & Orivel, 2012; Karsenti & Collin, 2011). Although ODL projects in FSSA are in their early stages of development, Tonye (2013) shows that they are spreading considerably, mainly since they are now part of the priority educational plans of States and universities. In addition to this institutional dynamism, Obono Mba (2008) also invokes the high enthusiasm of African students for OLD. Besides Tonye (2013, p. 104) describes as “spectacular” their attraction to these learning modes. In 2014, for example, 77.25% of admissions to OLD programs managed by the Agence Universitaire de la Francophonie, emanated from Sub-Saharan Africa, of which 43.4% were from West Africa and 30.67% were from Central Africa. The two most represented French-Speaking countries were Cameroon (13.65%) and Burkina Faso (10%).

These are all contextual elements which make today, the ODL systems in FSSA constitute one of the topical topics of research in education (Depover & Orivel, 2012). Even if 90% of research currently done on ODL emphasized on those in the West (Ben Henda, 2011), those developing in this part of Africa also constitute more and more sources and avenues of inquiry (Loiret, 2013a). Books, articles, and thesis are thus written, both by local and foreign researchers, as described in the table below.

Table 1

*Panorama of Topics on ODL in FSSA*

<p><b>Justifying reasons for the implementation of the OLD in FSSA</b></p> <p>Baranshamaje (1996) Guidon &amp; Wallet (2007) Kane (2008) Karsenti &amp; Collin (2010, 2011, 2013) Lamago (2011) Loiret &amp; Oillo (2013) Loiret (2007) Loiret (2008) Ndiogou Ndiaye (2011) Oillo &amp; Loiret (2006) Tonye (2010)</p>	<p><b>ODL as a solution to the problems of training in FSSA universities</b></p> <p>Baranshamaje (1996) Courmaré (2010) Guidon &amp; Wallet (2007) Kane (2008) Karsenti &amp; Collin (2010, 2011, 2013) Lamago (2011) Loiret &amp; Oillo (2013) Loiret (2007, 2008) Loiret (2013b) Marquet, Mohib Najoua, Schaming &amp; Papi (2013) Oillo &amp; Loiret (2006) Tonye (2013)</p>	<p><b>The ODL's potentials for FSSA universities</b></p> <p>Baranshamaje (1996) Depover &amp; Orivel (2012) Dogbe-Semanou (2010) Guidon &amp; Wallet (2007) Karsenti &amp; Collin (2010, 2011, 2013) Karsenti (2011) Lamago (2011) Lishou (2008) Loiret (2006) Ndiogou Ndiaye (2011) Ndiogou Ndiaye (2011)</p>
<p><b>The cooperative component of the OLD in FSSA</b></p> <p>Ben Henda (2005) Benchenna (2006, 2008) Depover &amp; Orivel (2012) Guévert <i>et al.</i> (2009) Guidon &amp; Wallet (2007) Inzoli &amp; Zouya Mimbang (2013) Kane (2008) Loiret (2007, 2008, 2013a, 2013b) Loiret &amp; Oillo (2013) Marquet <i>et al.</i> (2013) Ndiogou Ndiaye (2011) Oillo &amp; Loiret (2006)</p>	<p><b>Description of ODL implementation in FSSA</b></p> <p>Akouete-Hounsinou Madoué (2012) Candat (2002) Diop (2005, 2015) Dogbe-Semanou (2010) Fournier Fall (2006) Lekeaka Alemnge (2015) Loiret (2008, 2013a, 2013b) Ndiogou Ndiaye (2011) Oillo et Loiret (2006) Tonye (2013) Touré (2014)</p>	<p><b>The historic dimension of ODL in FSSA</b></p> <p>Guidon &amp; Wallet (2007) Inzoli &amp; Zouya Mimbang (2013) Kane (2008) Kokou Awokou (2007) Loiret &amp; Oillo (2013) Loiret &amp; Oillo (2013) Loiret (2007, 2013b) Oillo &amp; Loiret, 2006</p>
		<p><b>Critical postures on ODL in FSSA</b></p> <p>Benchenna (2006, 2008) Loiret (2006, 2007, 2008)</p>
<p><b>Motivations, Representations and Identities of Actors Relating to ODL</b></p> <p>Depover &amp; Orivel (2012) Obono Mba (2008) Tonye (2010) Karsenti &amp; Collin (2010, 2011, 2013) Fournier Fall (2006)</p>	<p><b>Feasibility conditions for ODL in FSSA</b></p> <p>Akouete-Hounsinou Madoué (2012) Lamago (2011) Obono Mba (2008) Tonye (2008)</p>	<p><b>Challenges of ODL in FSSA</b></p> <p>Dogbe-Semanou (2010) Guidon &amp; Wallet (2007) Karsenti &amp; Collin (2010, 2011, 2013) Tonye (2010)</p>

Concerning these writings on ODL in FSSA, no work has so far established a literature review. The studies carried out by the Association for the Development of Education in Africa (2011), Depover and Orivel (2012), Guidon and Wallet (2007), Kane (2008), Karsenti and Collin (2011, 2013), Loiret (2013a), and Tonye (2008), examine just the state of development of ODL in Africa. None set the state of research on this topic. Although Peraya (2008) made a critical account of the book edited by Guidon and Wallet (2007) on comparative study on distance learning in Sub-Saharan Africa, he does not provide a more in-depth look at the state of this question in FSSA. In conclusion, this research status does not provide a clear understanding of the achievement and trends pointed out by researchers on ODL in FSSA. Hence this work, which presents a portrait of research on ODL in this part of Africa, would be useful for the structuring of this domain of knowledge. It thus highlights various topics developed on distance learning in FSSA, including those which justify the creation of this training mode in this context.

To constitute our corpus, we consulted more than 12 French open databases in social and human sciences, using research requests similar to “open and distance learning in French-speaking Sub-Saharan Africa.” We thus systematically selected all the studies that deal with this topic. In this regard, we defined ODL as learning systems which can be synchronous or asynchronous, hybrid or not. In ODL, the rupture of the spatial unit between teachers and learners, the complementary and the plurality of learning situations, and the various forms of mediations are based, in whole or in part, on the use of computer networks (Choplin, 2002; Glikman, 2002; Dieumegard & Durand, 2005). At the end of our data gathering, we collected 42 published papers on ODL systems in FSSA. The analysis of the lecture notes provides 10 highlighted points that characterized this research field, as described below.

## Description of the ODLs Implemented in FSSA

In the scientific literature on ODL in FSSA, the description of the implemented system occupies a special place. Condat (2002) describes thus the African Virtual University briefly five years after its launch. After reminding its ambitions, she exposes its techno-pedagogical system, which leads her to underline its old equipment and its high financial costs. She shows that the same observations as those put before to justify its implementation, resurface again. Loiret (2008) also concludes in the same way. While describing the 10 years of experience of this virtual university, he criticizes its technological positivist approach, before embarking on the characterization of the implementation methods of the distance learnings at the Agence Universitaire de la Francophonie (Loiret, 2013a, 2013b; Oillo & Loiret, 2006). In the same way as these authors, Diakhaté (2014) and Diop (2015) expose both the successes and the tensions in distance education systems at the University of Cheikh Anta Diop of Dakar. Akouete-Hounsinou Madoué (2012) reaches the same conclusion regarding distance learnings in Benin. In the same vein, Lekeaka Alemnge (2015), who examines the ODL system at the University of Buea (Cameroon), highlights two significant aspects: the steps and conditions for their implementation, and the components and methods of their operation. Ndiogou Ndiaye (2011) and Tonye (2013) both used this approach in their studies. The first drew a techno-pedagogical portrait of the ODL program at the University of Cheikh Anta Diop of Dakar. The second focused on the analysis of the distance master program in telecommunications at the National Advanced School of Engineering of Yaoundé. In this system, which he describes as a hybrid, he distinguishes three principal actors: pedagogical, administrative, and coordinators. For Dogbe-Semanou (2010) and Touré (2014) respectively, it is the limited interaction between these types of actors, which explains the high dropout rate amongst distance Togolese students, and the slight autonomy of those in West Africa in general.

Overall, descriptive research on ODL systems in FSSA brings out both successes and mistakes. To explain this latter aspect, Diop (2005) stress the insufficiencies in infrastructures facilities, distribution of tasks, and teachers' training and financial motivation. Akouete-Hounsinou Madoué (2012) also underlines their sociotechnical deficits and the low articulation conditions between distance and face-to-face mode. Ndiogou Ndiaye (2011) insists on the lack of distance learning development policies and the questionable institutional and social recognition of ODL graduates. For this author, as for Tonye (2013), it is the reasons why no matter the real projects conceived, there is a low rate of appropriation of the ODL by the local students, teachers, and university managers (Diop, 2015; Fournier Fall, 2006).

## Gaps in FSSA Universities: The Main Justifying Reasons for the Implementation of ODL

The reasons underlying the interest and necessity of ODL projects for African universities are one of the most advanced topics. The most obvious ones highlight the shortcomings of these universities, hence the transversality of an African educational crisis idea in most research (Kane, 2008; Karsenti & Collin, 2011; Loiret, 2008; Ndiogou Ndiaye, 2011). Baranshamaje (1996) and Oillo and Loiret (2006) also respectively emphasize these gaps as justifications for the implementation of ODL at the African Virtual University and the Agence Universitaire de la Francophonie. As written by Loiret and Oillo (2013), ODL projects at these two institutions consider educational systems in African universities as unsuitable for the evolution of knowledge and the needs of societies.

Moreover, they show that the teachers' qualifications represent the central area in which the educational crises in the ASSF are manifested (Oillo & Loiret, 2006). These crises include the lack of qualified resources (Karsenti & Collin, 2011, 2013), the limitations of their scientific, technical, and vocational



training (Lamago, 2011) and the use of unskilled teachers (Guidon & Wallet, 2007). Learning and research structures and infrastructures are also not spare. Baranshamaje (1996) and Ndiogou Ndiaye (2011) consider them to be absent, inadequate, or ineffective. The same applies to academic staff, and technological and educational systems, which Lamago (2011) describes as defective. This situation leads to further gaps and deficiencies of African university systems, namely the overcrowding of halls, the inadequacy between employment and learning, and the worrying issue of unemployment (Karsenti & Collin, 2010; Ndiogou Ndiaye, 2011).

Justifying the ODL provided by the Agence Universitaire de la Francophonie for French-speaking African universities, Oillo and Loiret (2006) also emphasize on their limited access to scientific and technical information. For them, the libraries and documentary resources centers of African universities are poorly equipped and not updated. In Lamago's (2011) point of view, this leads to a low pedagogical involvement of teachers and researchers in the production of knowledge. For its side, Baranshamaje (1996) places the reason for this low pedagogical productivity in the anachronistic, impertinent, and unsuited character of the educational programs of African universities. For him, as for Ndiogou Ndiaye (2011), this result in deterioration of the quality of teaching and research, as well as the imbalance between learning and employment, and a high percentage of failure, dropout, and repetition (Lamago, 2011). In addition to this documentary and curricular slump, Ndiogou Ndiaye (2011) also points out the role of financial difficulties, financing crises, and education planning deficits in the deterioration of the Sub-Saharan African education system. Tonye (2010) adds four other factors that are more global and structural, such as the obligations linked to the development of the socio-professional world, the competitiveness of Western universities, the globalization of education, and the obsolescence of African academic governance.

Karsenti and Collin (2010, 2011, 2013) summarize these shortcomings of the French-speaking Sub-Saharan African universities in three-fold obligations: strong staff growth, reduced finances, and unprofitable job market. It is in this sense that Baranshamaje (1996) brings into question all of the components and missions of these University systems. He then concludes that they have failed in the past and, moreover, are not prepared to meet the challenges of the future. Hence the use of ODL systems as solutions to overcome their imperfections (Karsenti & Collin, 2010, 2011, 2013; Oillo & Loiret, 2006; Tonye, 2010).

### **ODL: A Solution to the Problems of Training in Universities of FSSA**

As it appears in these two articles (Baranshamaje, 1996; Loiret, 2008), research on ODL in FSSA does not only emphasize the weaknesses of African university systems; it also presents distance learning as the solution. So, ODL systems as the answer to the educational crisis in Africa is one of the most advanced topics in this area. For Kane (2008), this perspective links the international distance learning offer to the problems diagnoses on which it is building as an ideology. Guidon and Wallet (2007) as well as Coumaré (2010) present thus the ODL as engaging answers to gaps in initial and continuous training within the French-speaking Sub-Saharan universities. Lamago (2011) also describes these third-generation learning modes as an alternative remedy to the difficulties the African higher education face. For Kane (2008), ODL projects function as antidotes to the challenges of African universities. Karsenti and Collin (2010, 2011) characterize them as the “appropriate answer” (p. 74) or the “interesting alternative” (p. 494) suited to African academic crises. These two last authors also explain that as a necessity both for students and teachers, ODL systems in Africa allow the intervention of experts from the developed countries. As written by Oillo and Loiret (2006), the implementation of distance learning

programs in Sub-Saharan is expected to solve its higher education crisis, which has had no outcome despite many summits and conferences on education in Africa. In brief, authors describe them as the solution to four main problems: insufficient professional training, university massification, limited access to library and ICT resources, and poor quality of education and research.

This conceptualization of ODL in FSSA appears mostly in studies on their implementation in this context. So, talking about the African Virtual University, Loiret (2008) says that its creation was the World Bank's answer to crises African higher education. Likewise, while describing the ODL at the Agence Universitaire de la Francophonie, Marquet, Mohib Najoua, Schaming, and Papi (2013) consider them as a response to the urgent need of empowering Africa in solving its academic crisis. It is also in that perspective that Loiret and Oillo (2013) conceive French-speaking ODL. For them, the creation of digital Francophone campuses in African universities fights against the quantitative and qualitative deficiency of their scientific and academic documentation. Globally, the description of the implementation of ODL in FSSA in the scientific literature makes them an opportunity to solve the weakness of its university systems.

The advertisement made by Loiret (2013b) on continuous and distance learning in computerized information network at the *Ecole de Bibliothécaires Archivistes et Documentalistes de Dakar* is a pertinent example. He describes it as the best alternative and the way to a new rise of this school. ODL programs thus intervene here at a critical moment whereby the institution was going through some crises: the loss of its regional vocation, the decrease in the number of international students and the inadequacy between learning curriculums and the societal development. Tonye (2013) also places the creation of the ODL in Master of Telecommunication at the National Advanced School of Engineering of Yaoundé, as the response to the need for engineers in that domain.

### **The Potentials of ODL for FSSA Universities**

By describing the ODL projects as answers to FSSA university crises, research indeed mentions their qualities for these institutions. Authors like Baranshamaje (1996) and Karsenti and Collin (2010) emphasize the benefits of ODL, placing them on a scale that does not evaluate their limits. In this regard, Ndiogou Ndiaye (2011) describe distance learning programs as a “real hope” for FSSA universities (p. 129), and Lamago (2011) sees in them a “beneficial alternative for professional's continuing education” (p. 13). Dogbe-Semanou, (2010) also stresses the contributions of ODL to the solving of African educational crises, as a battery of solutions. Besides, Baranshamaje (1996) justifies the implementation of ODL systems at the African virtual university. He argues that they are the “the only way” for Africa to achieve education for all (p. 123). He explains that the technology of distance education programs possess enormous potentiality by which it can improve the quality education in Africa.

Comparing the ODL projects in FSSA, Guidon and Wallet (2007) also highlight their profitability for this continent and conclude that without them, “it would take 200 years to train the needed number of teachers” (p. 16). Besides, Lamago (2011) mentions that the implementation of ODL projects in FSSA would then make it possible to curb the significant deficiency of professionals and to reinforce their contributions to the development of their countries (Lamago, 2011). These are as many as qualities of the ODL for the African countries that Depover and Orivel (2012) set out also to demonstrate.

Also, based on a specific case, Lishou (2008) exposes, as the coordinator of the ODL system at the *Université Cheikh Anta Diop* of Dakar, its benefits. Among these lasts, he highlights the significant improvement in the quality of teaching and the qualitative transformation of the educational format

coupled with a substantial return. On the student's side, the author testifies that distance learning allows a high quality/comfort relationship of course follow-up, which was not the case with overcrowded and non-equipped classes. Analyzing the contexts and practices of ODL projects in Sub-Saharan Africa, Karsenti and Collin (2010, 2011, 2013) also present their advantages for this continent. They explain that these potentials are closely related to the objective of qualifying vocational training of workers, which Africa needs for its development (Karsenti & Collin, 2013). In the same way as Depover and Orivel (2012) or Ndiogou Ndiaye (2011), these authors show that, in this context, OLD systems allow accommodating a more significant and diverse number of students than in the traditional classes. So, for them, this learning mode can help to efficiently develop skilled African laborers (Karsenti & Collin, 2011). They support that, through distance learning, FSSA will no longer need external expertise for its development. On the contrary, ODL programs allow it to keep its human capital locally.

One of the ODL potentials on which Karsenti and Collin (2010) emphasize for this part of Africa concern precisely the professional development of Africans through continuing education and a long life learning. They argue that ODL enables learners to follow vocational training out of their immediate socio-professional environment while remaining on the spot. By this way, distance learning programs give Africa the means to stop the brain drain and to have qualified professionals available and on-site (Karsenti & Collin, 2011). Besides, by studying the profiles of ODL students at the Agence Universitaire de la Francophonie, these authors highlight favorable results obtained. Even if they find some differences in students' achievement, they do not attribute them to the ODL. For them, these dissimilarities occur in any continuing education (Karsenti & Collin, 2010). They explain thus that distance learning systems can provide an enormous potential for the professional development of Africans while being on the spot.

### **The Cooperative Component of the OLD in FSSA**

Research on OLD systems in FSSA shows that they are part of partnership networks. If authors like Benchenna (2006, 2008) criticize them, thinking that they are not advantageous to African education, others as Ben Henda (2005) and Guévert et al. (2009) emphasize their importance for African universities.

Kane (2008) and Ndiogou Ndiaye (2011) distinguish three types of partnership actors involved in the implementation of ODL projects in FSSA. The first category includes international organizations such as the Association pour le Développement de l'Éducation en Afrique, the Agence Universitaire de la Francophonie, the World Bank, the United Nations for Education, Science and Culture Organization, and the United Nations Development Program. The second group refers to countries such as Belgium, Canada, the United States, France, India, and Switzerland. The third is made up of networks, initiated by any of the countries or organizations above, and constitute the frameworks for the development of ODL systems in Sub-Saharan Africa. In this last category of ODL projects in Africa, Depover and Orivel (2012) include the Regional Bureau for Education in Africa, the French-speaking university campuses, and the center for applications, studies, and resources in distance learning. Loiret (2013a) also mentions the Institut for Information and Communication New Technologies, the Pan-African network project, the African Distance Education Network, the African Virtual University, the French-speaking Virtual University, and the Swiss Virtual University. As Depover and Orivel (2012) and Guévert et al. (2009) write, these interventions of foreign partners reflect the high involvement of the West in the development of ODL systems in FSSA, and thus constitutes one of their specificities. Besides, Guidon and Wallet (2007) conclude that these ODL are the result of a series of recommendations stemming

from various meetings and international cooperation on education and the information society in Africa. Ndiogou Ndiaye (2011) also underlines the role the global partnerships in the conception and implementation of distance training programs in FSSA.

Among the foreign partners of the ODL projects in FSSA, the Agence Universitaire de la Francophonie and its French-speaking digital campuses are the most described (Loiret, 2013a, 2013b), which appears as the colonial heritage of this part of Africa (Inzoli & Zouya Mimbang, 2013). Most researchers like Benchenna (2008), Diop (2015), Fournier Fall (2006), Kane (2008), Marquet et al. (2013), and Oillo and Loiret (2006) fully underline their role and action in the implementation of distance learning projects in FSSA. According to Loiret (2007, 2008), it is the Agence Universitaire de la Francophonie which validates their creation and facilitates their development through its digital campuses. Marquet et al. (2013) define these virtual campuses as mechanisms put in place by this Francophone Agency in African public universities, intended to follow them in their educational technology integration (Loiret, 2007). Ben Henda (2005) also argues that these partnerships are beneficial for Africa for two main reasons. The first is that they contribute to ensuring the quality of higher education in the South and to reducing the digital breaking between this part of the globe and the North. The second reason is that they are as an opportunity for the Southern countries to contribute to the standardization of the ODL systems by valuing their linguistic and cultural specificities. Especially for Loiret and Oillo (2013), most of these partnerships take into account learning programs and diplomas existing within the local African universities.

If some authors like Benchenna (2008), Loiret (2013a), and Marquet et al. (2013) exalt these global partnerships, others criticize them. Benchenna (2006, 2008) presents thus French cooperation in ODL projects in Africa, not as an act of solidarity, but as a strategy of its geopolitical position. For this researcher, the Agence Universitaire de la Francophonie is more useful for the internationalization of French university courses than for African universities, especially regarding the globalization of education and the competition with the Anglo-Saxon ODL offerings. He also questions their economic logic and their deterministic and paternalistic approaches, which increase the dependence of the universities of the South on those from the North. Benchenna (2008) also explains that these partnerships within the implementation of ODL systems in Africa draw a division of roles in which experts from Northern countries are designers and those from the South as the subcontractors.

### **The Historical Dimension of ODL in FSSA**

The historical description of ODL systems in FSSA is one of the least advanced topics in the scientific literature. Nevertheless, research carried out by Kane (2008), Loiret (2006, 2007, 2008) and Loiret and Oillo (2013) outline their transformation. Each of these authors describes the evolution of the distance learning program at the Agence Universitaire de la Francophonie. Kokou Awokou (2007) also distinguishes two significant movements in the development of the ODL programs in some French-speaking countries in West Africa. The first step is that of the use of audiovisual media. He situates this early stage before 1990. Distance and mediation tools were postal, print, audio, and videos cassettes. Distance education courses were thus in the form of correspondence courses and educational radio. He shows that this program was designed to improve literacy and school enrolment of students in rural areas. On the contrary, the second moment of ODL is digital. Here, distance is expressed in of the internet technologies and intervenes in a context of educational crisis and economic gloom. If the author points out a breaking between the two moments due to the cessation of the first experiments, he shows that there is a close relationship between the evolution of the ODL program and its political,

economic, technological, and educational context. He also mentions the role of external partners and international meetings in the development of ODL systems in French-speaking West Africa.

Concerning the ODL systems in FSSA, Guidon and Wallet (2007) indicate that they started in 1970 as correspondence courses for teachers. However, they mainly result from the World Conference on Higher Education in Paris in 1998. Besides, these authors wrote that distance education programs are also part of recommendations of the World Education seminar held in Dakar in 2000 and the Committee on the Teachers' Status organized in Geneva the same year. Inzoli and Zouya Mimbang (2013) describe ODL systems in FSSA as "ready-made" training, contrary to those implemented in English-speaking Africa where they are similar to industrial enterprises. For these researchers, the history of ODL programs in African countries agrees with the paths of their colonial history. In FSSA mainly, they remain touched by the intervention of the Agence Universitaire de la Francophonie of which Loiret (2007, 2013b) makes the historical description. He shows that the ODL programs offered by this francophone agency began in 1980. Their objectives were to solve the limited access to academic and scientific libraries in French-speaking African universities, by putting in place an open resources program (Oillo & Loiret, 2006). Ten years later, this program has been extended by including the development of ODL systems, particularly in French-speaking Africa. It is particularly in this regard that Loiret and Oillo (2013) situate the creation of the French-speaking virtual university in 1998 and its digital campuses in 2000.

### **Motivations, Representations, and Profiles of ODL Users**

The scientific research on the ODL systems in FSSA also emphasizes the motivations and representations of students and managers towards them. Two aspects of these social images appear in the literature: the institutional one and those from the learners. Describing the representations of African institutional managers on ODL, Depover and Orivel (2012) show that they have a positive attitude to integrate this program into their educational system. Moreover, Obono Mba (2008) argues that there is a consensual opinion on this point among university managers. She points out that in Gabon, university leaders perceive the ODL programs as a strategy to help students developing more skills and knowledge. She also explains teachers consider distance education as a tool to fulfill the needs of continuous education. That is why institutional managers exalt and sublimate ODL systems and technology. On the students' side, Tonye (2010) shows that the attraction for ODL programs is also mesmerizing, even though they have no idea at the beginning of their learning. In fact, at the first steps of their distance learning, Karsenti and Collin (2011) note that they proceed on a process of familiarization with the systems. Students thus provide psychologic and methodological efforts to adjust their initial conception of the ODL systems to the requirement of this later. As they use it progressively, their representations change as to innovate both in collaborative and individualized activities (Karsenti & Collin, 2011).

Regarding the motivations for the ODL programs, Karsenti and Collin (2011) show that for these students, the development of their professional skills is the primary factor. Students find in distance education programs a way to improve and remedy their gaps connected with their education, employability, and adaptation to the socio-economic and professional issues (Karsenti & Collin, 2010). For Karsenti and Collin (2013), it is the reason why students enrolled in the ODL programs in FSSA are in majority practitioners, who have a job. Fournier Fall (2006) defines them as a public different from students of traditional higher education. These distance learning students are adults, workers, and graduates of higher education, who have acquired initial training and some professional experience

(Karsenti & Collin, 2011). They are also mostly city dwellers; they are people that can bear the high costs of registration in an ODL system and to acquire documentary and technological facilities necessary for distance learning (Fournier Fall, 2006).

### **Feasibility Conditions for ODL in FSSA**

Research on the ODL systems in FSSA also evaluate their implementation factors. In this regard, the study carried out by Tony (2008) underlines their low-deployment in Central Africa and explains their feasibility conditions. He concludes that improving distance learning systems in this African sub-region goes through their contextualization, which is essential to meet local issues. While emphasizing the importance of developing technological and structural infrastructures, Tonye (2008) also presents the social anchoring of technologies as an essential condition for their implementation. He shows that for the ODL systems to develop, they must adapt to the African context through an engineering model of learning, which enlightens their practical implementation possibilities.

Akouete-Hounsinou Madoué (2012) also explains that this adaptation of ODL systems to local African contexts must go through a modelization, which can identify and analyze local needs first and foremost. She argues that the ODL programs in Sub-Saharan Africa must be a contextualized answer to meet the local concern, rather than a method which obliges to adopt those whose contents and objectives are far from African realities. Therefore, she insists on the optimization of their administrative, pedagogical, and technological methods in the African contexts, while overcoming the difficulties associated with traditional continuing education. Lamago (2011) also stresses these aspects. By observing closer the interest and feasibility of distance learnings for Cameroonian teachers, he emphasizes, on the one hand, their technological, structural, financial, administrative, and pedagogical predispositions, and on the other side, the availability and usability of educational technology resources. Finally, Obono Mba (2008) summarizes the conditions of a successful distance learning project in Sub-Saharan Africa in four requirements: promotion of techno-pedagogical skills, psychological preparation, financial and technological supports, and development of institutional partnerships.

### **Challenges of ODL in FSSA**

Taking into consideration the mixed picture of the ODL programs in FSSA, many researchers expose the challenges to be met. The most important one is about the information technology equipment.. In this regard, Karsenti and Collin (2010, 2011) show that it is essential that institutions and individuals should equip themselves with the necessary tools for the success of ODL projects. They suggest then to reduce the technical distance, which also includes the technical mastery of an ODL systems.

Apart from this challenge, Karsenti and Collin (2010, 2011) also underline the one related to the development of students' skills. They argue that the development of such learning modes in Sub-Saharan Africa depends on students' ability to self-discipline, autonomy, responsibility, and self-regulation. Hence, the importance of reducing the temporal distance. For Guidon and Wallet (2007), this is the way to attenuate the high dropout rates in distance learning programs in Africa, as well as to minimize sociocultural distance. Describing this last challenge regarding the evolution of students' representations toward the ODLs, Dogbe-Semanou (2010) shows that personal factors as motivation and positive attitude towards technologies and distance are essential to promote. Tonye (2010) reaches the same conclusion regarding teachers' training and skills. Dogbe-Semanou (2010) explains that teachers' skills, as well as students' digital literacy and institutional policies, contribute to improving

the retention and persistence rates of learners in ODL programs, which is another challenge in the French-speaking African context.

### **Critical Postures on ODL in FSSA**

If many researchers on ODL in FSSA carried out their studies in a descriptive or exploratory approach, some like Loiret (2006, 2007, 2008) and Benchenna (2006, 2008) adopt critical postures nevertheless. The first examines the ODLs at the African Virtual University, while the second author analyses those at the *Agence Universitaire de la Francophonie*.

Studying the first decade of the African Virtual University, Loiret (2006, 2007, 2008) examines three crucial aspects: the reasons justifying its creation, the approach of its design and implementation, and its governance and development policy. Thus, Loiret (2007) shows that its foundation dwells on motives and objectives that systematically challenge African university systems. For this author, these reasons which are the source of their delay and their inability to fill the gaps, do not determine their causes. He explains that these arguments do not take into consideration the context of structural adjustment policies in which African universities have evolved. Hence, for Loiret (2006, 2007), the creation of the African Virtual University involves a mistake in the conception and appreciation of the African academic contexts, as well as an attempt to instrumentalize innovation. Reinforced by a deterministic technological approach, which gives priority to technical and economic materials over local realities and resources, this innovation perspective was leading to bring the ODL systems out of African context. Because of the challenges of African universities, Loiret (2007, 2008) shows that the World Bank presented the African Virtual University as the only solution, endowed with techno-pedagogical qualities by which it would transform them. Besides, this author considers the inadaptability of the ODLs at the African Virtual University to the African context, as one of the causes of the end of his limitless ambitions. Except that the critics he addresses, benefit the strategic aspirations of the *Agence Universitaire de la Francophonie* to which he belongs.

Benchenna (2006, 2008) also shows that like the African Virtual University, the distance learning systems at the *Agence Universitaire de la Francophonie* function as a solution to African universities crisis. He even sees in these ODLs a paternalistic approach and a technological determinism that relegate the interest given to local resources and issues. For him, the implementation of distance learnings at the *Agence Universitaire de la Francophonie* is a competitive response to the African Virtual University and the English-speaking world initiatives which dominate the global learning market (Benchenna, 2008). He also presents francophone ODL systems as the right arm of the internationalization of French training policy in a context of global education. This author demonstrates that ODL systems at the *Agence Universitaire de la Francophonie* are not only educational, they are also a mechanism which causes the dependence of French-speaking African universities towards their counterpart in the North. Besides that, Benchenna (2006, 2008) supports that distance learning at this francophone agency reduces the international movement of African students, minimize their accessibility to education, and redistribute the roles between Northern and Southern actors.

## **Conclusion**

Throughout this work, we have described the state of research on ODLs in FSSA, which brings out its portrait throughout the identification of some main topics. One of them refers to the reasons justifying

the implementation of distance learning systems in this part of Africa. The scientific literature on this issue leans on the deficiencies of its university system: insufficiently qualified teachers, lack of structures and infrastructures, university massification, poor library, and funding crisis, which weakens learning and research. Therefore, authors like Baranshamaje (1996) describe ODL systems as a solution to these educational crises, which engender the inability of African universities to adapt themselves to the world and to participate in the development of their countries. Research on distance learning systems in FSSA shows that their openness and flexibility make them able to reach a significant number of students and to facilitate their socio-professional development through expertise from Northern countries (Karsenti & Collin, 2011). While some researchers appreciate the partnerships with the North, which constitute one of the characteristics of ODL in FSSA (Guévart et al., 2009), others like Benchenna (2008) see them as a geopolitical positioning strategy of Western countries. Despite these ODL systems are an outcome of international meetings (Kane, 2008), Inzoli and Zouya Mimbang (2013) describe them as resulting from the colonial history of African nations, hence the importance of the Agence Universitaire de la Francophonie in FSSA (Loiret, 2013a).

The scientific literature on the ODL projects in this part of Africa highlights promising discourses of institutional managers. Researchers also underline the positive and evolving representations of students in ODL systems in FSSA. These students register in distance learning programs given their professional development (Karsenti & Collin, 2010). In this regard, many authors stress the description of the implementation and development conditions of ODL projects in this context. Like Tonye (2008), they thus expose their successes as well as their hesitation due to several lacks. As solutions to improve ODL projects, these authors list various challenges, like technological equipment, promotion of local skills, ODL development policies, funding policies, and their contextualization (Guidon & Wallet, 2007). It is related to this latter aspect that Benchenna (2008) and Loiret (2008) address criticisms respectively to the ODL at the Africa, Virtual University, and the Agence Universitaire de la Francophonie.

Regarding the dynamic of ODL projects in FSSA, this literature review shows that research must particularly emphasize many issues. One of them concerns their history, including their socio-cultural implementation. The innovations they bring and the transformations they generate in the organization of African universities should also be analyzed. Their hybridization, and precisely the articulation between the distance mode and the traditional learning, are another perspectives. In the same way, it is essential to examine the socio-pedagogical practices in ODL programs and to analyze how participants appropriate this third-generation education.



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