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Editorial – Volume 19, Issue 1



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Welcome to this first edition of IRRODL for 2018. This issue begins with several articles focusing on learners, including papers on collaborative learning, self-pacing, interaction, and student readiness for m-learning. Other learner-focused papers include those on attrition and retention, group work, and learners' intentions. These papers are followed by a diverse mix of papers investigating applications, quality, videos, MOOCs, and implementations.

The first paper by **Chang, Chiu, and Huang** investigated the use of mind-mapping to help sixth-grade (K-12) students to learn using mobile devices. The investigators added digital archive data to encourage students to collaborate to develop their knowledge, achieving positive results.

Kocdar, Karadeniz, Bozkurt, and Buyuk developed a scale for determining the self-regulated learning skills of distance learners in self-paced open and distance learning courses. Their analysis suggested that goal-setting, help-seeking, self-study strategies, managing physical environment, and effort regulation, were important in promoting self-pacing and in helping students to acquire new skills in an online environment.

In their investigation of students participating in connectivist learning, **Wang, Anderson, and Chen** tracked a cMOOC. They analysed how blogs, Twitter, Facebook, and video-conferencing supported their learning and social interactions. Results suggest that learners could be divided into four categories: unconnected floaters, connected lurkers, connected participants, and active contributors.

Costley and Lange investigated motivation and its relationship to cognitive load in semi-formal group work settings. This supports previous research showing that groups benefit low-motivated students more than the highly motivated.

Virtual reality is the subject of **Huang and Liaw's** paper in which they take a constructivist approach. They attempt to establish effective techniques to motivate learning among students. Their research demonstrates that the perception of self-efficacy and interactions are important indicators of learning motivation to use VR.

The discourse on Twitter surrounding openness was investigated by **Paskevicius, Veletsianos, and Kimmons**. Using a mixed-method analysis, they followed the development of the openness conversation from

OER to include emerging discussion on open practices.

The status of quality in a Kenyan university is the subject of **Hadullo, Oboko, and Omwenga**. This investigation includes quality issues relating to course design, content support, social support, administrative support, course assessment, learner characteristics, instructor characteristics, and institutional factors.

Using the Technology Acceptance Model (TAM), **Nagy** looked at video usage in a Mathematics course. Learning performance and interactions were also examined. Results showed that learner perceptions had a direct effect on video usage, and this usage had a significant effect on both learning performance and learner satisfaction.

In another video study, **Bayeck and Choi** looked at cultural dimensions in MOOCs' introductory videos. The authors found that the videos reflect the culture of the countries that created them and offer suggestions for creating such introductory videos.

Adham, Parslow, Dimitiadi, and Lundqvist studied segregated gender in MOOCs using avatars. The authors created a female avatar as a tutor for social interactions in order to address concerns raised by gender segregation.

Zawacki-Richter, Bozkurt, Alturki, and Aldraiweesh conduct a content analysis of research on MOOCs. They reviewed hundreds of articles using a text-mining tool. They found that research focuses on four main lines of research including challenges, platforms, learners/content, and quality.

Examining MOOCs in Tourism and Hospitality, **Lin and Cantonie** explored the experiences of instructors as they decided to implement and deliver the MOOCs. Findings show that the institution's interest in MOOCs was the prime motivator. The different phases are described including the instructors' proclivity for risk avoidance, but who nevertheless continued to participate in MOOC delivery.

Chorianopoulos has created a taxonomy of educational video formats that attempts to allow for comparison studies and meta-analyses. The taxonomy establishes a comprehensive design space for understanding the learning video landscape.

The final paper returns us to the K-12 sector with **Taylor and McNair's** paper describing virtual school startups in California. Interviews found the following as critical for the success of the startups: establishing founder, preliminary research, district support, teacher and staff selection, financial evaluation, and curriculum decisions.

A Research Note and a book review round out this issue. In Turkey, **Ozcan** examined the motives of administrators for establishing online programs and **Cifuentes** gives us a book review of an elearning handbook.



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A Sharing Mind Map-oriented Approach to Enhance Collaborative Mobile Learning With Digital Archiving Systems



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Abstract

With the advances in mobile network technology, the use of portable devices and mobile networks for learning is not limited by time and space. Such use, in combination with appropriate learning strategies, can achieve a better effect. Despite the effectiveness of mobile learning, students' learning direction, progress, and achievement may differ. Thus, the enhancement of learners' opinions on the usability and interactivity during mobile learning are challenging issues to overcome. This study developed a sharing mind map-oriented mobile learning system integrated with valuable information preserved in a digital archiving system. In addition to the functions of traditional mind maps, this system also enabled students to complete and record relevant information that they had found onto the mind map and further improve the integrity of their own knowledge. To investigate the effectiveness of this teaching approach, this study added digital archive data and used mind map sharing to help learners develop knowledge. By using the proposed approach, students were able to perform self-assessment on learning content, choose appropriate learning directions, and progress according to their level of learning. At the same time, they could collaboratively learn with peers to engage themselves more deeply in their learning. That is, their learning motivation could be constantly triggered through the observations and sharing of mind maps from one to another. This study selected sixth graders as its research subjects in two classes at the school where one researcher works. There were 31 and 30 valid samples in the experimental group and control group, respectively, with a total of 61 students. The experimental group was conducted by using sharing mind map with corresponding geographical archived information to investigate the effectiveness of sharing mind map (SMM) in mobile learning; on the other hand, the control group was conducted by using a traditional learning approach. The outcomes indicate that students' learning performance could be enhanced by using archived information SMM mobile learning.

Keywords: sharing mind map, collaborative mobile learning, digital archive, peer learning

Study Background

In recent years, due to the process and enhancement of knowledge and science, e-learning management systems have increased rapidly. Many studies have pointed out that these techniques could optimize learning processes and effectiveness. Many scholars have utilized network technology for learning and statistical analysis, confirming the enhancement of the efficiency of learning by network technology. The development of mobile devices (e.g., smart phones, laptops, tablets, and so on) with wireless communication technology has changed the centuries-old rules for classroom instruction, resulting in breakthroughs in teaching methods (Biddix, Chung, & Park, 2016). Due to the portable properties of mobile devices, mobile learning helps students to cooperate with others to improve their self-learning. Through mobile devices and wireless networks, e-learning can be conducted in informal learning contexts, such as outdoor teaching (Huang & Chiu, 2015; Hwang, Wu, & Ke, 2011; Park, Nam, & Cha, 2012). Mobile learning can also make it possible to share knowledge quickly and help to enhance memorization.

Recently, content-aware environments, such as augmented reality and GPS positioning information, have been integrated into the learning process (Huang & Chiu, 2015). However, because it is not location based, the learning effectiveness of mobile learning can only be assessed using various quantified reference values (e.g., number of hits, record of number of hours) of various learning behaviors. Students' actual perception of how effective their learning has been is usually ignored. In terms of the development of structured learning goals and objectives, it appears that students are not capable of planning learning progress by themselves. When students have to plan learning progress on their own or encounter learning obstacles, their progress tends to slow down and their learning effectiveness is affected. This situation can be resolved through the influence of peers, namely through collaborative learning (Chen & Chang, 2016; DeWitt, Alias, & Siraj, 2014). Eid and Al-Jabri (2016) investigated the relationship between sharing knowledge and independent learning in a college course. The results showed that the paired sharing mind model could benefit collaborative learning and learning activities, so as to enhance learning effectiveness. Sadeghi and Kardan (2016) suggested that computer supported technology can promote the potential of collaborative learning.

One way to examine how shared learning takes place in situations where it is difficult to infer the internal state of an individual within a group is when those individuals use graphic expression methods to interact with a collaborative and virtual learning environment using mobile devices. This makes it possible for every participant's interactions to be followed automatically. Zheng, Huang, Hwang, and Yang (2015) examined the degree of collaborative learning in a group by comparing the prior knowledge of group members before entering the group, and the knowledge demonstrated by the group after collaborating together. An analysis of the interactions between group members, and of the knowledge acquired, was undertaken by studying the group's computer-assisted knowledge maps. The results showed that scientific and technological tools brought about positive benefits to the enhancement of knowledge via collaborative learning. Contemporary students live in an era when information is expanding rapidly all around them. To make sense of all this information, they generally need some special methods, such as mnemonics, flow charts, and so forth. One of these special methods is the mind map (MM), which was first introduced by Buzan and Buzan (1996). Although the concept of the MM was not given much attention when it was first introduced, it has proven to have many advantages over other traditional methods for assisting

learning. For instance, MM can effectively present information, which one hears or sees in a rich visual form, and MM can allow learners to use both of their left and right brains simultaneously, which can make it easier for learners to present their ideas. Liu, Zhao, Ma, and Bo (2014) summarized and integrated learning improvement related articles to understand learning efficiency via MM.. The results showed that MM could actually help improve learning. Moreover, numbers of studies showed that concept maps improved study quality in higher education. Radix and Abdool (2013) employed mind maps to facilitate creative learning tools. The actual collective creation with course mind maps in radiate structure could also effectively improve study quality.

Motivation for the Study

The introduction of mobile devices and digital archive resources changes the learning tool being used and adds additional content, which is an easy-to-achieve objective from the perspective of using technology (Johnston, Berg, Pillon, & Williams, 2015). However, from the pedagogical perspective, what matters is whether this learning system can assist the learning process and improve the way learning takes place (Chiu & Huang, 2015; Hwang et al., 2011). One way to make this assessment is to see if the use of a collaborative mobile learning system and the development of a collaboratively built digital archive can actually improve the quality of student learning (Ke & Hsu, 2015). The purpose of this study was to design and use mind mapping and digital archiving as a tool for learners to self-construct their knowledge collaboratively and to see the degree to which this system helped learners expand their observations about the subject matter and interact with the learning environment. A key component of this system was its ability to make it possible for individual learners to observe their peers' working results when they were experiencing difficulties or were feeling unmotivated. The purpose was to motivate learners' interest by making it possible for them to improve or expand their own the mind maps by comparing them with their peers. During the process of sharing each other's mind maps, learners could understand how their peers presented different materials; then in turn, they could think through and expand their own perspectives. By using these techniques on their mobile devices, learners could reach their learning goals effectively without having to study in one geographic space.

Research Questions

In this study, an experiment was conducted by using shared mind maps with corresponding geographical archived information developed by the Taiwan e-Learning and Digital Archives Program (TELDAP) in order to investigate the effectiveness of sharing mind maps (SMM) in a mobile learning context. The following issues were thus explored:

1. When comparing the process of SMM in collaborative mobile learning and traditional learning, is SMM in collaborative mobile learning more effective than traditional learning?
2. In terms of the usability and interaction, is SMM in collaborative mobile learning more effective than traditional learning?

Literature Review

Digital Archives System (DAS)

Digital archives are one of the main sources of digital learning materials (Frumkin, 2005; Johnston et al., 2015; Marchionini, Plaisant, & Komlodi, 1998). Furthermore, Fuchs, Muscogiuri, Niederée, and Hemmje (2004) have suggested that digital archives can support digital learning since they collect and preserve information about human civilization over time, which provides teachers and students with valuable content to share and discuss together. In fact, many European countries have made great efforts to digitize their culture and history. These include the development of digitalized collections in the Vatican Museum, the Louvre Museum, the British National Gallery, the British Museum in London, and the British Library. Among them, the Vatican Museum has digitized valuable Vatican manuscripts to make them available for scholars all over the world to engage in historical study. The Louvre Museum has succeeded in digitalizing most of its collection with a special emphasis on multimedia technology. The British Museum selected specific collections for digitization focused on particular educational themes. In Taiwan, the National Science Council started to systemically sponsor a series of digital archive-related programs in 1998.

Johnston et al. (2015) defined digital archiving as the process where the collection of physical objects is converted into digital form, namely, the use of digitization technology to preserve physical objects or non-physical objects which have value. To be more precise, the main objective of digital archives is to ensure that the digital data can be accessed, revised, and constantly archived. The actual contents of digital archives are collected, arranged, and organized using systemic and digitized approaches. During the process of digital archiving, metadata are essential construction elements. “Metadata” are used to define and divide electronic resources, as well as to assist in the accessibility of data (Chiu et al., 2016; DeRidder, 2007), enabling users or learners to easily look for the information they would like to learn about. Abundant and diversified contents in digital archives are excellent sources of teaching materials for teachers. The most appropriate teaching material resources can be assembled according to subject, field, and object. For learners, metadata are the best medium offering access to knowledge bases. With advanced mobile technology, if learners can use mobile devices to access relevant information collected as part of a field study, their learning interest and effectiveness can be enhanced.

Sharing Mind Map (SMM)

Buzan and Buzan (1996) came up with the idea of using graphs to improve people’s ability to think. They called this assistive tool a mind map. A mind map is the use of images to present the thinking surrounding a central theme. Each idea is presented as a node on the graph, and can be linked to the semantic relations of other nodes. Owing to the linkages among semantic relations, each idea can be represented graphically and can be hyperlinked to webpages or other Internet resources. A mind map is composed of useful and organized ideas, can be very useful in decision-making, and can serve as a highly dynamic instrument for reorganizing ideas (Huang & Chiu, 2015). In computer-supported cooperative work, a collaborative mind map can be used in the brainstorming activities of learners (Shih, Nguyen, Hirano, Redmiles, & Hayes, 2009; Wilson, Copeland-Solas, & Guthrie-Dixon, 2016). Recently, web technology-based mind map tools such as MindMeister and bubbl.us. have been developed. Shih et al. (2009) have proposed an experimental Group Mind system based on the improved collaborative software mind map proposed by

FreeMind to explore the factors affecting the development of collaborative mind maps. Their experiment revealed that collaborative learning by using mind maps could achieve some advantages such as assisting teachers in fulfilling their duties, fully understanding and grasping students' ideas, and cultivating and organizing classes and groups.

Collaborative Mobile Learning (CML)

With the development of network technology, mobile learning or m-learning, is defined as the use of handheld devices in the classroom to connect with provided location-based content to achieve learning (Chiu & Huang, 2015; Hwang et al., 2011). M-learning enables people to learn authentically through the local context. Thanks to mobile technology, learning resources become accessible and even exchangeable among learners through a portable device. For example, Wu, Hwang, Su, and Huang (2012) used m-learning and sensing technology to provide students with professional skills training, and enabled students to practice standard operating procedures through practice in actual field projects. Through data exchange using a mobile network, learners can overcome the limitations of time and space, interact with other peers, and further increase their learning interest and efficiency. On the one hand, learners can share learning information through the network. On the other hand, they can find peers with common interests by practicing communication and developing a population of correspondents for collaborative and cooperative learning. Formative assessment can also be used to establish an m-learning environment with enhanced effectiveness (Huang & Chiu, 2015; Ryu & Parsons, 2012; Valk, Rashid, & Elder, 2010). To show the advantage of m-learning, Sandberg, Maris, and de Geus (2011) conducted an experiment which concluded that class learning could be taken to the next level by including field-based m-learning. Mobile environments appear to enhance collaborative learning. For instance, Huang, Jeng, and Huang (2009) depicted the development of an omnipresent learning environment via an annotation service, wireless telecom equipment, and jigsaw collaborative learning process. Through the statistics collected from the after-class survey, they showed that an annotation service provided by mobile equipment can aid in promoting students' learning potential. Mobile devices have become attractive devices in many aspects of education and learning. Many studies have focused on the value of mobile learning for students. Biddix et al. (2016) probed into the potential of mobile devices in the professional development of teachers. It has become increasingly important for educational researchers to use qualitative and quantitative methods to examine the integration of mobile learning in education, and to examine its effectiveness on learning (Ke & Hsu, 2015; Lee et al., 2016; Park, 2011; Hwang, & Chang, 2016). The mobility afforded by electronic devices appears to be having a significant effect on students' ability to gain new knowledge, skills and experience.

Sharing Mind Maps to Create Mobile Collaborative Learning

In this study, a mobile collaborative learning environment was implemented to help learners construct their knowledge collaboratively through sharing mind maps. This study employed SMM for mobile collaborative learning, using digital archived information as the learning material for a local history course.

As shown in Figure 1, the sharing mind map mobile learning system mainly includes terminal learning components and server management components. Teachers and students can use different mobile devices (e.g., cellphones, PC, NB, and tablet PCs) to store data and use terminal learning components to engage in

learning activities. They can also use mobile networks to store the data of digital archives and mind maps on the server.

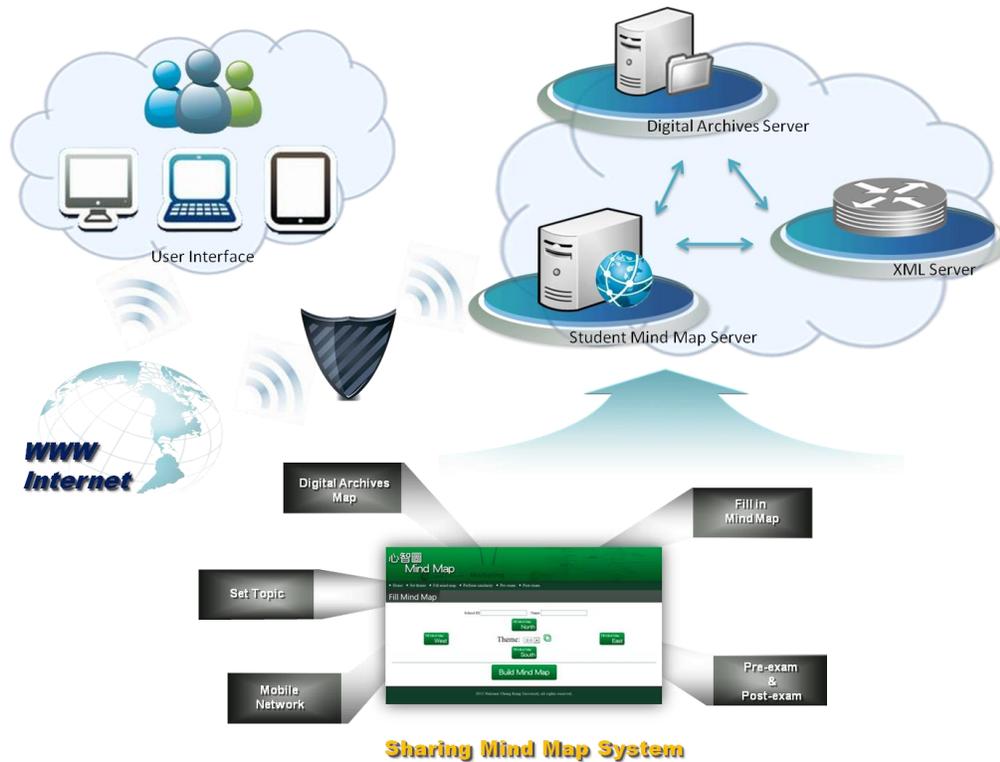


Figure 1. Architecture of the sharing mind map for mobile collaborative learning systems.

Sharing mind map system is written via HTML and JavaScript on mind map geography. The data are mainly saved as XML format. The XML file is shown as Appendix B. The framework is written based on PHP. The purpose of using these different languages is to enable the system to be used on different platforms or any mobile devices to achieve mobile learning.

The modules provided by terminal learning components for teachers to use include a mind map theme setting module, a students' pre-and-post test score management module, and a digital archive information management module. In the mind map theme setting module, teachers can set up the learning theme according to the learning content to enable students to complete their mind maps based on that theme and through this process achieve learning effectiveness. In the students' pre-and-post test score management module, teachers can set up test questions in the server to pretest students' ability levels before they engage in learning activities. When the learning activities are concluded, post-tests of the experiment can be performed to assess how much students learned. This study intended to use pre-and-post test scores to verify whether the sharing mind system proposed in this study is feasible and effective for learning. In the digital archive information management module, teachers had to upload relevant learning materials into the digital archives for use in learning activities. When students are engaged in m-learning, searching for relevant keywords should automatically bring up relevant archived information for students to study (Figure 2).



Figure 2. Digital archive information management module.

The learning mind map module. When students engage in thematic learning, they enter theme-related simple keywords in a diffusible form through the mind map. This helps them develop their overall thinking as well as their skills, because the mind map helps them develop their logic, organize ideas hierarchically, and construct images, which capture the relationship between ideas.

The pre-and-post experimental test module. During the experiment, students' performance on the pre-and-post experiment may vary. In that way, it is able to access whether the students have absorbed and understand the knowledge of the theme more quickly via sharing mind map.

The system questionnaire module. At the end of the overall learning experiment, the students in the experimental group and control group were asked to complete a system questionnaire to demonstrate their understanding of the usefulness, ease of use, interactivity of the system, and the users' acceptance for the system.

The community sharing mind map module. The mind map was used to set up a Facebook page to enable students to interact with teachers and classmates.

They could share their learning obstacles and achievements through communities and screen displays. (Figure 3)

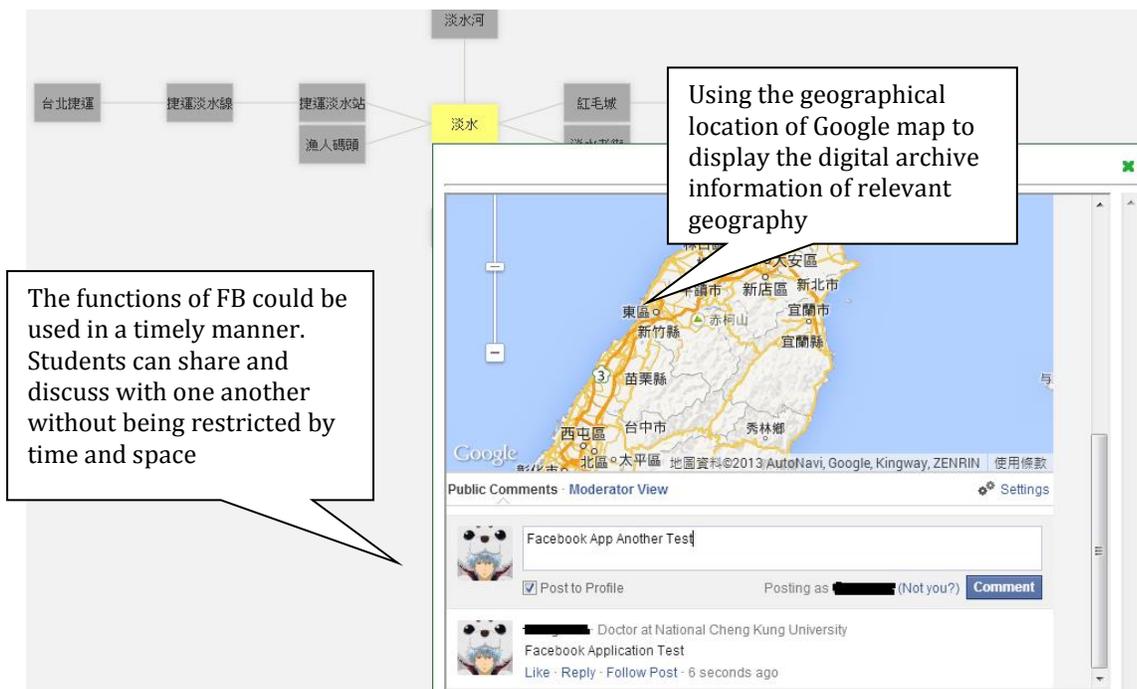


Figure 3. Community sharing mind map module.

Research Design

The learning activities were associated with geography and social studies in an elementary school, and were a part of the existing school courses. This study used mind maps and the digital archives information system to integrate relevant regional culture with history. Students' learning activities were composed of class teaching and outdoor field learning. During this study, the teacher could provide students with supplementary teaching materials in advance. Students could also add relevant information they found during the learning process.

Participants

The participants in the experiment were the sixth graders in two classes at the school where one of the researchers was a teacher. The students were divided into two groups. There were 31 valid samples in the experimental group, and there were 30 valid samples in the control group, with a total of 61 participants.

Experimental Procedure

First, the teacher established mind map-related themes in the system, and established the digital information of relevant themes in the system. The teacher set up the questions of the pre-and-post tests for the students in this system. The students were requested to undergo a pre-test before completing the mind map. This pre-test was intended to assess the students' degree of understanding of relevant themes before they were exposed to the information resources provided by this system. Afterwards, the students started to learn the digital information in the digital archive of the themes established by the teacher (as shown in Figure 4). In the example established in this study – the theme of “Danshui,”- students were shown scenes of Danshui in Japanese colonial times and screens of Danshui in the present time (as shown

in Figure 5). The students could rapidly understand the track of historical changes in Danshui to deepen their understanding of how historical change took place.

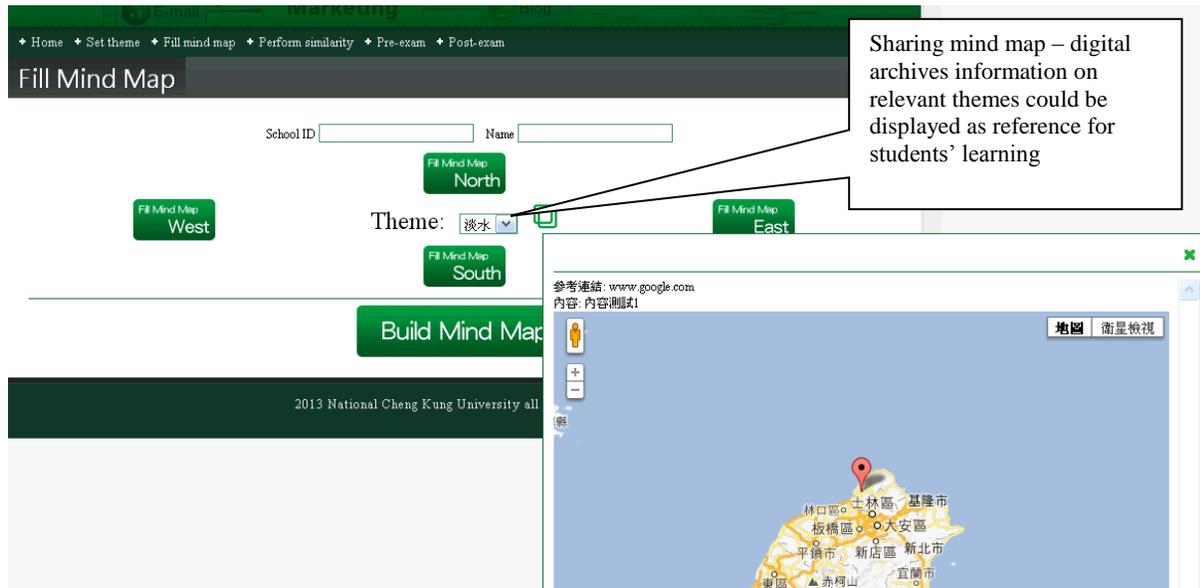


Figure 4. Digital archive map – Danshui.

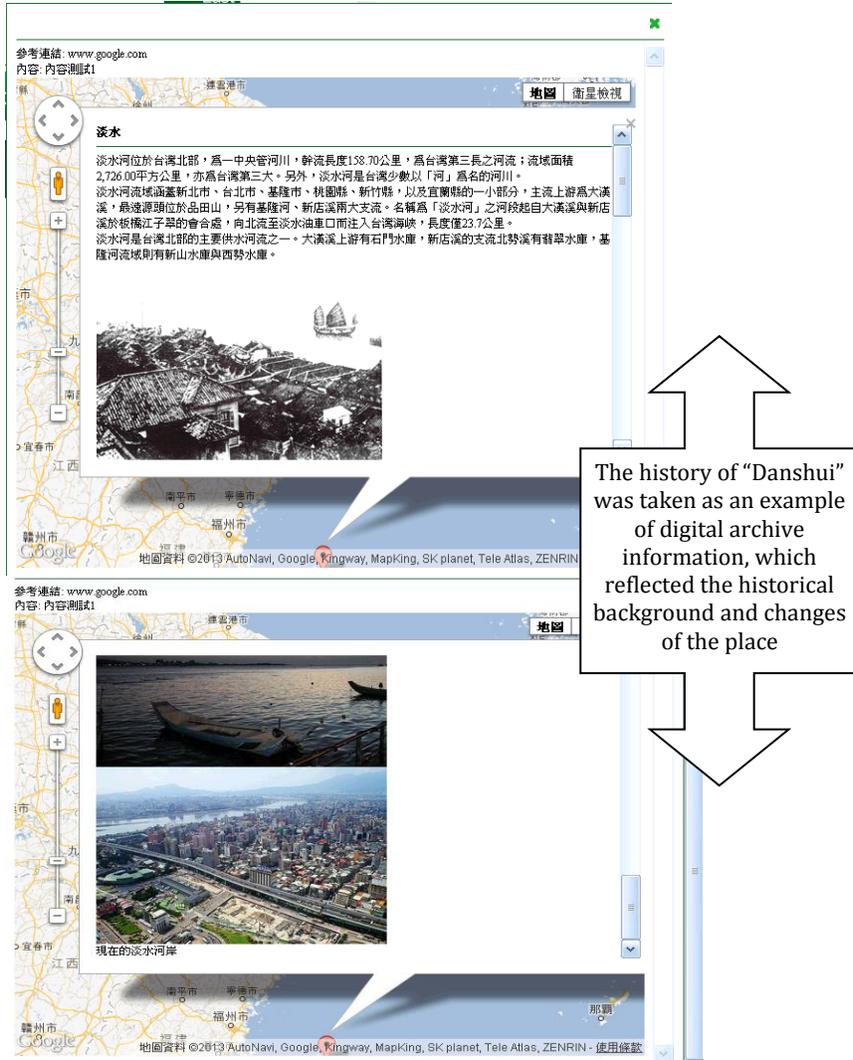


Figure 5. Digital archive map – Japanese colonial era and current status.

The students could complete the contents of a mind map after understanding the theme. In this assignment, in addition to filling in the traditional “keywords,” the students could also fill in the site addresses they had researched, upload pictures, and fill in important content to enrich the information entered on the mind map. The developed mind map is shown in Figure 6. The keywords filled in by students could all automatically bring out relevant digital archive maps. The results could be provided for teachers to understand what content students had learned, as well as for peers’ to observe and learn from. At the end of the course, the teacher performed a post-test to assess the degree to which the content knowledge of the students had increased between the student pre-tests and post-tests, as well as the benefits of such learning to students, after they had completed relevant mind maps and data searches. A detailed analysis of the experimental data are given in the following sections.

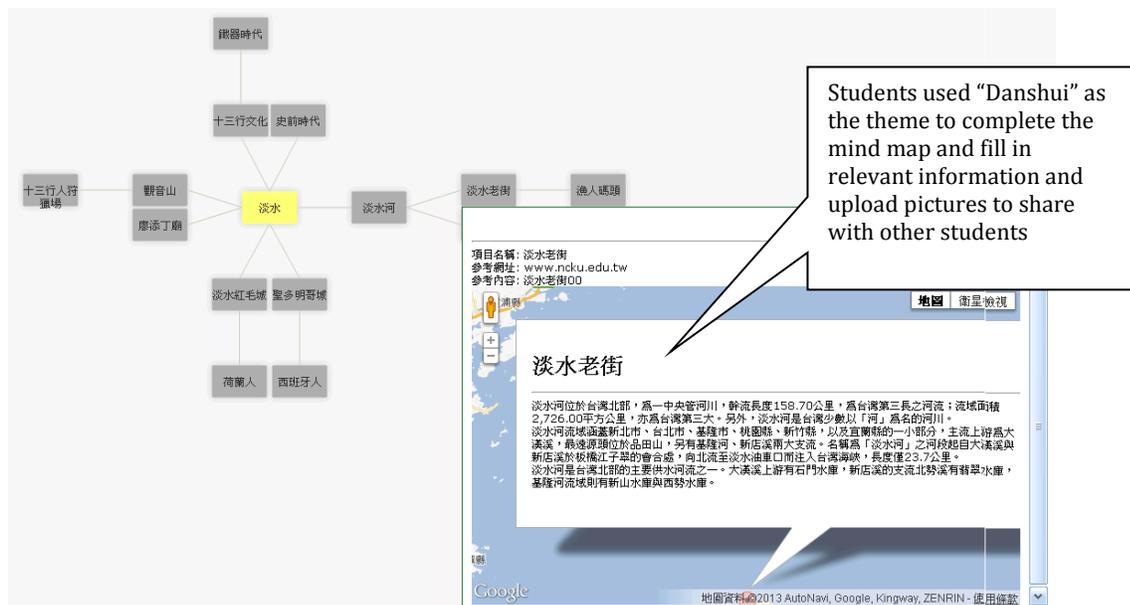


Figure 6. Development of the mind map.

This study used a mind map sharing system as the mind tool for learning. The students were assisted with their learning through observation and interaction in the learning environment. After the learners digested the knowledge they had learned in this study, their mind maps were further developed. Moreover, based on a comparison of similarities among the shared mind maps, the system further recommended mind maps with similar knowledge structures for learners to observe so that they could look at the learning achievements of other classmates. If users detected knowledge options that was different from what they had observed themselves, they could engage in self-learning and modify their own mind map structure.

This study focused primarily on differences in learning between two groups of learners using different learning approaches in the same learning environment. This study used the statistical method of dependent sample t-tests to test the two different kinds of mind maps developed by the learners and to analyze whether the sharing mind map system designed in this study improved the integrity of learners' knowledge structures.

Furthermore, this study used the mind map as a predictor variable, and used simple regression analysis to predict learners' perceived post-test scores. This study used statistical correlation analyses to perform its tests.

The experimental procedure of learning activities of the experimental and control group is shown in Figure 7.

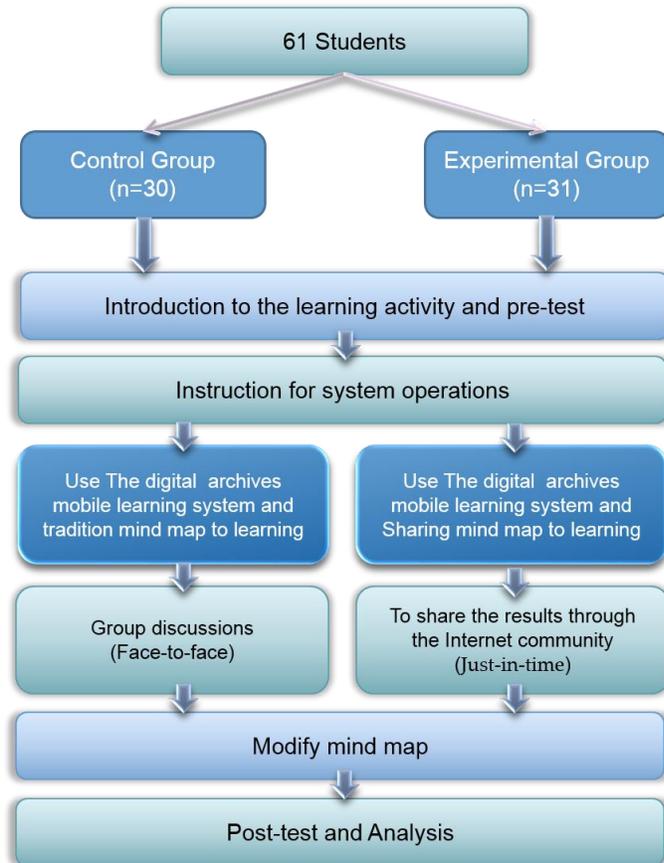


Figure 7. Experimental procedures.

This section investigated whether there was any difference in students' learning achievement in social studies after they participated in the teaching activities under different concept mapping models. This experiment selected the sixth graders in two classes as the subjects at the school where the researcher worked as a teacher. The subjects were divided into two groups. To conduct an objective study, the students in resources classes were excluded.

As shown in Figure 8, the students in the control group did not personally visit the place where resources are archived. Although the control group used the same mind tool of digitally archived resources, they did not use the function of internet community and could not discuss or share with other classmates instantly. Supplementary teaching material resources could be uploaded to mobile learning devices by scanning the QR code. At the end of the course, the teams shared and discussed with one another in a face-to-face manner.



Figure 8. The learning activities of the control group.

As shown in Figure 9, the teacher led the students in the experimental group to the place where resources are archived to engage in SMM learning (The image is of Fort Santo Domingo). There was a built-in map of the route of the learning site in the mobile device that enabled students to look for the next place where resources were archived according to the images. Upon reaching the destination, the experimental group checked into places on Facebook. The system would instantly display the learning resources of the place to the experimental learning groups' mobile learning devices. In addition, they could use the internet community sharing mechanism to share with other teams. Other teams could engage in in-depth learning based on the information shared by the teams who had arrived earlier.



Figure 9. The learning activities of the experimental group.

There were 31 and 30 valid samples in the experimental group and control group, respectively, with a total of 61 subjects. The structured questionnaire used for assessment was developed according to formerly proposed digital archive systems. The students completed the questionnaire according to their level of agreement with the descriptions of questionnaire items. The levels of agreement were divided into 5 levels: (1) strongly disagree to (5) strongly agree. The result of the questionnaire is shown in Appendix A.

Results and Discussions

One of the aims of the study was to assess students' reactions to the mind map sharing model that they had been taught in this course. The following section presents an analysis of student responses to a

questionnaire designed to make this assessment of student reactions. As shown in the Appendices, this questionnaire was divided into three dimensions, including questions relating to the usability of mind maps (11 items), the ease of use (3 items), and the interactivity (3 items), resulting in a total of 17 items. This study used independent sample t-tests as a statistical method with a confidence level of 95%. A comparison of the two groups in terms of their response to using mind maps was as follows: The usability score of the experimental group was (Mean=44.29) higher than that of the control group (Mean=39.37), suggesting that satisfaction with the usability of the sharing mind map system was significantly greater than that of the traditional mind map system. In terms of ease of use, the score of the experimental group was (Mean=12.77) higher than that of the control group (Mean=12.17). In terms of interactivity, the score of the experimental group was (Mean=12.77) higher than that of the control group (Mean=12.17). The analyses and comparisons on the total scale and various dimensions are as follows (Table 1).

Table 1

T-Test Result of the Experimental Group/ Control Group

	Group	N	Mean	SD	t value
Usability	Experimental group	31	44.29	3.752	5.71***
	Control group	30	39.37	2.918	
Ease of use	Experimental group	31	12.77	1.309	1.86
	Control group	30	12.17	1.234	
Interactivity	Experimental group	31	13.42	1.232	13.64***
	Control group	30	9.10	1.242	

*** p <.001

Table1 focuses on students' acceptance of the sharing mind maps. The higher the score was, the more students accept the teaching approach, which indicates sharing mind map to be useful. A total of 11 questions are included. With a full score of 55, the average score of the experimental (44.29) was higher than the control group (39.37).

To test and analyze the difference in learning for the two groups due to different approaches in the learning environment, this study used paired sample t-tests. The statistical results are shown in Table 2:

Table 2

Paired Sample Statistics

		Mean	N	SD	Significance
Experimental group	Pre-test	67.48	31	12.720	.000
	Post-test	83.26	31	11.036	
Control group	Pre-test	69.90	30	7.009	.000
	Post-test	75.33	30	7.284	

Within 95% confidence interval of the experimental group and control group, both the upper bound and lower bound did not include 0. The analysis for value of p was less than 0.001, showing significant difference in the average score of the two groups. This study used independent sample t-test to analyze the learning effectiveness of the experimental group and control group (as shown in Table 3).

Table 3

T-Test Result of the Pre-Test/Post-Test Scores

Variable	Group	N	Mean	SD	t value
Pre-test	Experimental group	31	67.48	12.720	-.92
	Control group	30	69.90	7.009	
Post-test	Experimental group	31	83.26	11.036	3.32**
	Control group	30	75.33	7.284	

** p < .01

The statistical analysis found that the average post-test score of the experimental group was 83.26 points, while that of the control group was 75.33 points. The results showed that there was a significant difference in the total scale scores relating to the acceptance of mind maps between the two groups ($t=3.32$, $p=.002 < .01$). The comparison of the learning performance of the concept mapping of the two groups showed that the learning performance of the experimental group was better, and the difference between the experimental group and control group reached a level of significance. Based on these analyses, the results showed that the overall acceptance of the group receiving the sharing mind map-assisted teaching was

higher than that of the group receiving the traditional mind map-assisted teaching. In addition, the difference reached a level significance. Moreover, compared with the traditional learning approach the learning effectiveness of sharing mind maps was better. According to an analysis of the responses to questions about the usage of digital archive resources during the experiment and following a review of the qualitative data of interviews with teachers and some of the students, this study has also attempted to define the way in which the introduction of digital archive resources to SMM influenced teachers' instruction.

The introduction of the SMM of digital archive resources to the teaching of social studies can enrich learners' knowledge and enhance their interest in mapping, which can then enhance their knowledge network. The introduction of SMM archive resources helps improve the problem-solving ability and attitude of teachers and learners. Such an interactive model can also improve teaching atmosphere. The teacher in this study suggested that the concept of digital archives in Taiwan still needs to be further developed. Existing comparisons of the development of foreign and domestic digital archives show that digital archives have attracted global attention. However, it is difficult to retrieve data from most of the teaching resource websites. It is easy to look for texts. However, it is difficult to look for multimedia data, such as images and videos. Good resource websites provide detailed classification and diversified data that are convenient to search. However, the content of poorly designed websites is scattered and cannot be easily retrieved. For effective data retrieval it is necessary and imperative to develop complete plans and technology for the retrieval of metadata. The TELDAP portal integrates many advantageous features. Therefore, this study introduced the resources of TELDAP to SMM to assist learners in developing their own knowledge networks. The TELDAP portal made it possible for learners to comprehensively obtain theme-related data and to explore topics in-depth. It also helped to trigger their learning interest, improve their learning attitude and willingness, and develop habits of spontaneous and comprehensive learning.

This paper has reported the results of an investigation into the introduction of digital archives to SMM and their advantages and disadvantages. These results are summarized as follows:

Advantages

- Proves to be useful, and supports persistence, interactivity, instant discussion, intelligent integration, and also provides users with the capability of permanently and properly storing data.
- Users are able to conveniently, rapidly, and accurately find the information they need.
- Provides free and high quality images without copyright concerns that can be freely used for teaching and commercial purposes.

Disadvantages

- The authenticity of some of the introduced archive resources of SMM is not high enough.
- Some of the collections introduced from archive resources of SMM are missing and are not reliable. Some of the digital archive resources where copyright acquisition is required are not fully available for retrieval, leading to incomplete data display on mind maps.

- The documentation of the history or origin of photographs of some of the introduced SMM archive resources are unclear.
- There are no user instructions or tips on the homepage of the SMM interface relating to introduced digital archive resources.

Learners' opinions on the usability, ease of use, and interactivity of the digital archive resources introduced in this study. According to the interviews with the subjects concerning the introduction of the SMM system of archive resources proposed in this study, the subjects suggested that they were highly interested in the integration of network communities using the mind map tool. In this digital era, almost every person has used social networks. Presumably, this makes it easy to use SMM. In addition, the subjects in the experimental group and control group indicated that they had used mind map tool Xmind in other courses. Therefore, they were familiar with drawing mind maps. However, they were still confused in the beginning when using the SMM where the two functions were integrated.

The operating interface of the SMM proposed in this study was different from the subjects' past experience using mind map tools. Since the subjects were younger, they encountered a few obstacles during the development of mind maps. In addition, there were no user instructions and interactive tips on the user interface. Therefore, before detailed explanations had been given, most of the subjects encountered setbacks when interacting with the interface. However, after trying several times, they gradually got used to the interface when using it to engage in instant sharing and interacting with the social network. Although teachers in some classes earnestly prepare teaching materials, the quality of some of the images they find online is inconsistent and images cannot be zoomed in on for the close observation of details. Fortunately the subjects in this study found that most of the images displayed in the SMM digital archive resources were high-resolution. After the class, the subjects indicated that the instant sharing mechanism of SMM enhanced their afterschool desire for knowledge. They became interested in looking for new tools or new perspectives to share with other subjects. SMM also increased parent-child interaction. Some students indicated that they would discuss what they were involved in with their parents and looked for answers together. They would even look for other mind map tools or apps for comparison and sharing.

It is apparent that this experiment enabled students to apply the concept of instant sharing to their learning mind map development process by involving themselves in a network community and by introducing digital archive resources. Based on the teachers' and students' user experience mentioned above, this study found that there will be an adaptation period for users to become familiar with the new technology. If user instructions or interactive tips can be added to the homepage for first-time users, they can use the system more easily and intuitively and will be able to smoothly edit, revise, and display their concept maps. This would help learners apply the SMM tool with ease and flexibly.

Conclusion

This study designed a sharing mind map system integrated with valuable digital information preserved in digital archives. In addition to the functions of traditional mind maps, this system also enabled students to complete and record relevant information, which they had found on the mind map, to further improve the integrity of their own knowledge. In order to investigate the effectiveness of this teaching approach, this study added digital archive data and used mind map sharing as a way to help learners develop knowledge. The results of the experiment showed that, compared to general digital archive resource learning systems, the learning effectiveness of this teaching approach was better. Moreover, according to the assessment of outside experts, the integrity of the learners' knowledge structure was indeed improved after they participated in this method of learning.

Although the sharing mobile mind map teaching approach proposed in this study verified the advantages of this system, two problems still have to be solved in future studies. One problem includes the exploration into the influence of cognitive style on learners. The site-dependent or site-independent nature of learners themselves will affect their learning effectiveness regardless of whether the sharing mobile mind map or the general digital archive learning approach is used. The second problem requiring exploration includes a look into the influence on elementary school students' perceived ease of use. This study did not investigate the influence of perceived usability and perceived ease of use on learning attitude. Future studies should develop experiments to investigate these issues.

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Appendix A

The Questionnaire Model

Usability (Strongly disagree)~5(strongly agree)
1. The use of this learning system makes me learn a certain digital archive theme better.
2. I feel that this learning system can help me discover my personal learning problems.
3. This learning system can help me understand the knowledge learned from a certain digital archive.
4. The use of this system for learning enables me to ponder on more themes of extended learning.
5. The functions provided by this system are beneficial to my learning achievements.
6. The feedback provided by this system enables me to understand a certain digital archive theme better.
7. The feedback provided by this system helps me systemically understand the knowledge learned from a certain digital archive theme.
8. The use of the feedback provided by this system enables me to focus on learning.
9. The feedback provided by learning system can help me effectively modify incorrect concepts.
10. The feedback provided by this learning system enables me to understand the concepts that I less understood before.
11. The information provided by this learning system is beneficial to improving my learning achievement of a certain digital archive theme.
Ease of Use (Strongly disagree)~5(strongly agree)
12. It is very easy to use this learning system to read messages via mobile devices.
13. It is easy to operate the interface of this learning system.
14. I can learn to operate this learning system in a very short period of time.
15. The use of discussion function provided by this system enables me to compare the learning direction of classmates with mine.
16. The discussion function provided by this learning system enables me to modify incorrect concepts in a timely manner.
17. The discussion function provided by this learning system is beneficial to my sharing of learning achievement of a certain digital archive with my classmates.

*Note. The levels of agreement were divided into 5 levels: (1) strongly disagree; (5) strongly agree.

Appendix B

Mind Map XML Format

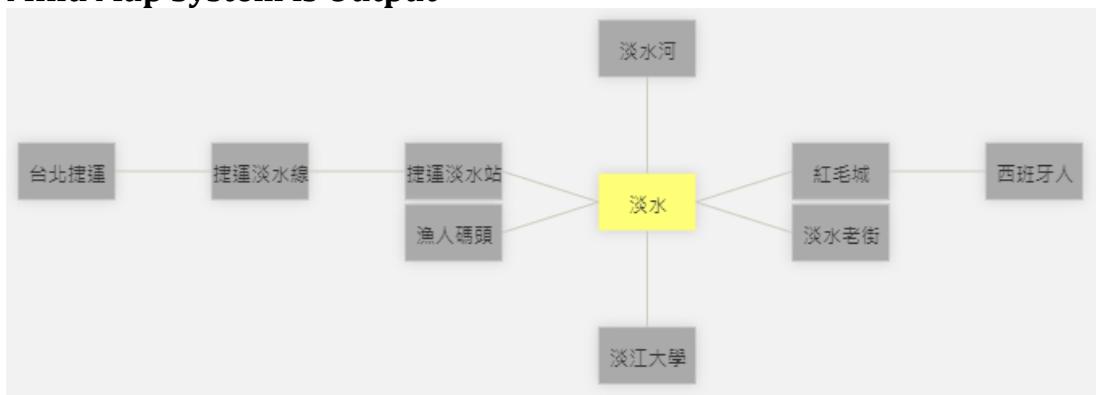
Mind map XML format requires theme code, student id number, and the location to make the file name. The file content needs to include a student id number (`school_id`), name (`full_name`), and the theme (`theme`). Every child filled in by the students includes an id, name, and data. The related data are the url and the content. Every child might have more sub-children.

ex:

```
<?xml version="1.0" encoding="utf-8"?>
<content>
  <school_id>N123456789</school_id>
  <full_name>test name</full_name>
  <theme>1362474604</theme>
  <filled>
    <children>
      <id>f3266bdbcee8a1599b16d003f9dfa095</id>
      <name> Fort San Domingo </name>
      <data>
        <url>www.google.com.tw</url>
        <content>test1</content>
      </data>
      <children>
        <id>095ed5fcf5231a9c0604e8694e1fe087</id>
        <name> Spain</name>
        <data>
          <url>www.google.com.tw</url>
          <content>test2</content>
        </data>
      <children></children>
    </children>
  </children>
</content>
```

```
<id>39739a52e1f28be8f8329771b6c4b06b</id>  
<name> Tamsui [Danshui] Old Street </name>  
<data>  
    <url>www.google.com.tw</url>  
    <content>test3</content>  
</data>  
<children></children>  
</children>  
</filled>  
</content>
```

Mind Map System is Output



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Measuring Self-Regulation in Self-Paced Open and Distance Learning Environments



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Abstract

Previous studies have described many scales for measuring self-regulation; however, no scale has been developed specifically for self-paced open and distance learning environments. Therefore, the aim of this study is to develop a scale for determining the self-regulated learning skills of distance learners in self-paced open and distance learning courses. Participants of this study were 1279 distance learners who were part of self-paced distance learning courses in a public open and distance teaching university in Turkey. The items of the scale were prepared based on the literature review, expert opinions, and learner questionnaires. The items of the scale were reduced from 62 to 30 after expert opinions and validity and reliability analyses. For the validity of the scale, the exploratory and confirmatory factor analyses were conducted. The total variance was found to be 58.204%. The Cronbach's alpha coefficient calculated for the reliability of the scale was found to be .937. Five factors composed of goal setting, help seeking, self-study strategies, managing physical environment, and effort regulation emerged in the 30-item scale. Thus, it was concluded that the scale has a high validity and reliability. This scale is intended to help teachers and instructional designers in developing strategies that will enable learners to either enhance their existing self-regulated learning skills or help them to acquire new skills in self-paced open and distance learning environments.

Keywords: self-regulated learning, self-paced open and distance learning, flexible learning, independent learning, autonomous learners

Introduction

Learner-paced distance or e-learning courses provide learners with flexible and independent learning experiences, as they can start their courses at any time during the year, and complete them at their own pace (Anderson, Annand, & Wark, 2005). Distance learners can study and learn at any time and place they want; however, they are responsible for planning, managing, and assessing their learning processes

(Moore & Kearsley, 2012). These learners should know ways to achieve success and independently develop their skills (Dabbagh & Kitsantas, 2009; Wilson, 1997). The fact that distance learning is more flexible, learner-centered, and autonomous than face-to-face learning requires learners to be self-regulated and use their self-regulated learning skills more frequently (Kuo, Walker, Schroder, & Belland, 2014). Previous studies support the theory that self-regulated learners are more successful in distance learning (Kuo et al., 2014; Yukselturk & Bulut, 2007). Conversely, studies have also shown that most distance learners have difficulties in managing their learning processes, and, are thus, subject to failure (Barnard-Brak, Lan, & Paton, 2010; Lehmann, Hähnlein, & Ifenthaler, 2014). Failure frequently occurs during self-paced open and distance learning as the learners study at their own pace. For instance, most of the MOOCs are self-paced, and the success of the MOOCs mostly rely on the learners being self-regulated. Furthermore, the lack of self-regulated skills results in high dropout and low retention rates (Milligan, Littlejohn, & Margaryan, 2013; Littlejohn, Hood, Milligan, & Mustain, 2016).

Identification of self-regulated learning skills is important as these are learnable skills, and instructors can help learners acquire these skills (Azevedo & Cromley, 2004; Dabbagh & Kitsantas, 2012; Koçdar, 2015). There are scales in the literature that guide teachers to identify the self-regulated learning skills of learners learning either in face-to-face (Brown, Miller, & Lawendowski, 1999; Pintrich, Smith, Garcia, & McKeachie, 1991; Weinstein, Palmer, & Acee, 2016) or online (Barnard, Lan, To, Paton, & Lai, 2009). Although these scales serve for face-to-face or online courses, they are not based on learner-paced or self-study. Therefore, they primarily focus on classroom activities in structured learning environments involving schedules that do not fit well into a self-paced learning environment. Consequently, it is essential to determine the self-regulated learning skills that enable learners to regulate and manage their own learning processes in learner-paced open and distance learning environments. Determining these skills will aid the teachers and instructional designers in developing new strategies, which will either enhance the learners' skills in self-regulated learning or help them acquire skills crucial for a successful distance learning experience and becoming lifelong learners. Based on the above deliberations, the present study aimed to develop a scale to help identify self-regulation in self-paced open and distance learning environments.

Self-Regulated Learning

The concept of self-regulated learning, which emphasizes responsibilities of learners in their own learning processes and autonomy was first noted in the 1980s (Koçdar, 2015; Whipp & Chiarelli, 2004). According to Zimmerman and Schunk (1989), self-regulation is the ability of learners to effectively engage in their own learning processes metacognitively, motivationally, and behaviorally. Pintrich (2000) defined self-regulated learning as "an active and constructivist process whereby learners attempt to monitor, regulate, and control their cognition, motivation and behaviors after setting goals for their learning, are guided and restricted by their own goals and the learning environment they are in" (p. 453). Therefore, self-regulation is a set of strategies that significantly affect learning (Whipp & Chiarelli, 2004). Self-regulation includes setting goals, using effective strategies for regulating learning, coding and repeating information, monitoring performance, asking for help when needed, and having confidence in one's own skills (Dabbagh & Kitsantas, 2005; Zimmerman & Risemberg, 1997). A learner who can self-regulate is organized, does careful planning, and makes keen observations and assessments (Butler & Winne, 1995).

The argument that social context is important in self-regulated learning has been dominant for 20 years (Hadwin, Oshige, Gres, & Winne, 2010). Social context plays an important role in self-regulated learning (Zimmerman, 2000). Instructors or peers are external factors who become models to guide learners in self-regulation activities and provide feedback (Hadwin et al., 2010). They can support their beliefs such

as self-efficacy and goal centeredness, and help learners deal with their feelings such as anxiety and fear. These models can also help learners understand the correlation between their social and physical environments. From a social cognitive perspective, social context offers important opportunities that can support the self-regulated learning process. These opportunities include practices that include guiding elements, the control of learner, decreasing instructional support, and effective feedbacks (Hadwin et al., 2010; Zimmerman, 2000). Because of the social processes, learners can develop their competencies to meet challenges, for content and context. Consequently they become self-regulated learners (Hadwin et al., 2010).

Self-Paced Learning

Naidu (2008) defines self-paced learning as “a mode of learning that enables individuals to study online or with the help of portable technologies in their own time, at their own pace, and from their own place” (p. 260). Self or learner paced distance and e-learning courses at universities are based on increased learner independence and flexibility, as learners can start their courses at any time during the year, and complete them at their own pace (Anderson et al., 2005). Moreover, there are self-paced distance education courses with specific start and end dates such as the Open University of UK or Anadolu University courses. This type of flexible learning is also known as *learner-paced*, *self-study* or *independent study* (Anderson et al., 2005). Independent study is closely related to self-directed learning and self-regulation (Garrison, 2000). Bergamin, Werlen, Siegenthaler, and Ziska (2012) state that flexible learning requires learners to possess skills of autonomous and self-regulated learning already to effectively engage in learning activities that are open regarding time, pace, and content. Thus, self-regulated learning skills are critical for success in the self-paced distance and online learning environments (Barnard et al., 2009; Bergamin et al., 2012; Kaufmann, 2004; Koçdar, 2015). Table 1 shows the differences between instructor-paced and self-paced courses.

Table 1

Instructor-Paced vs. Self-Paced Courses

Instructor-paced courses	Self-paced courses
<ul style="list-style-type: none"> • Structured learning environment that is led by a faculty member or instructor, who sets the pace for the class. • Follow a set schedule. • Course materials become available at specific times as the course progresses due dates for assignment, start and end dates for exams. • Immediate feedback by the instructors. • May not be flexible regarding time and/or place. 	<ul style="list-style-type: none"> • Allow students to take courses at their own pace. • Do not follow a set schedule. • All the course materials become available when the course begins. • May have no start or due dates for exams and assignments. • Delayed feedback by the instructors or tutors. • Flexible regarding time and/or place.

*Adapted from “Differences between instructor- and self-paced courses,” by edX, 2018 (http://edx.readthedocs.io/projects/edx-guide-for-students/en/latest/SFD_self_paced.html) Copyright 2018 by edX.

Related Studies

Researchers have developed several scales to determine the self-regulation skills of university students. The most commonly used scale is the Motivated Strategies for Learning Questionnaire, (MSLQ) which

was developed by Pintrich et al. (1991). The Self-Regulation Questionnaire (SRQ) (Brown et al., 1999) and the Learning and Study Strategies Inventory (Weinstein et al., 2016) are the other scales used to identify the supporting self-regulated learning skills, but these scales were developed for face-to-face learning. Therefore, these scales are not useful in learner-paced open and distance learning environments. In addition to these scales, the Online Self-Regulated Learning Questionnaire (OSLQ), which can be used in online settings, was developed by Barnard et al. (2009). However, OSLQ is also not appropriate for the learner-paced open and distance learning experience and is used mostly in cohort-based online learning settings. This indicates the need for a self-regulated learning skills scale for learner-paced distance learning practices. Therefore, the aim of this study was to develop a scale for determining a learner's self-regulated learning skills, which are necessary for success in learner-paced open and distance learning.

Method

A scale is a tool, mechanism, or instrument by which individuals are distinguished from one another based on the variables of interest in a meaningful way (Sekaran & Bougie, 2016). The primary goal of scale development is to create a valid measure of an underlying construct (Clark & Watson, 1995). Thus, this study employed a seven-stage process to develop a scale for measuring the self-regulation skills of learners who continue their education in learner-paced open and distance learning environments.

Setting Item Pool

A literature review regarding the topic was conducted first, and similar studies were determined (Barnard et al., 2009; Brown et al., 1999; Pintrich et al., 1991; Weinstein et al., 2016). The reviewed studies were used and the opinions of researchers and field experts were noted. Moreover, an online questionnaire form consisting of open-ended questions was sent to distance learners. The questionnaire was answered by 17 learners. A pool consisting of 62 items was generated based on the analysis of previous studies and the responses obtained from the questionnaire that was sent to learners. The item pool was designed including both positive and negative items.

Developing the Draft Scale

Items were prepared using a 5-point Likert type scale including "strongly agree," "agree," "slightly agree," "disagree," and "strongly disagree." In positive items, the scores of "strongly agree," "agree," "slightly agree," "disagree," and "strongly disagree" ranged from 5 to 1, respectively, and the scores were reversed in the negative items.

Ensuring Content Validity

A commonly used method for determining content validity that represents the quantitative and qualitative competence of items is to consult experts (Buyukozturk, 2009). In this regard, the 62-item pool was presented to obtain expert opinions, and its content validity was tested. The 62-item scale was presented to seven experts for evaluation in a way to indicate seven different dimensions, which were determined based on previous studies. The experts were selected from researchers having a PhD and working in the field of open and distance learning. After the evaluation of experts, the item pool was reduced to 55, and the suggested adjustments were made.

Implementation Stage

The participants were distance learning students enrolled in self-paced courses at Anadolu University, which is a public, dual mode, open and distance teaching university in Turkey and is considered as a mega university (Daniel, 1996) with more than 2 million students. The developed draft scale was published in the eCampus System that can be accessed by all students enrolled in more than 60 different undergraduate programs in the open education system of the university. The scale was designed in a way that enabled each student to answer it only once. It remained in the system for 10 days, and 1, 279 students responded to the scale. As seen in Table 2, 57% (n=729) of the participants were male, whereas 43% (n=550) of them were female. The age of the participants varied significantly ranging from 16 to 69.

Table 2

Demographics of the Participants

		Age category									Total
		16-21	22-27	28-33	34-39	40-45	46-51	52-57	58-63	64-69	
Gender	Male	53	180	149	130	107	69	30	9	2	729
	Female	32	133	95	103	91	61	30	2	3	550
Total		85	313	244	233	198	130	60	11	5	1279

Item Analysis and Construct Validity

First, an item analysis was conducted by using data obtained from the implementation, and then the correlation between the scores obtained from each item and the total scores obtained from the entire scale were calculated. The items whose item-test score correlations were below .30 were excluded. Exploratory Factor Analysis was conducted on the other items. The number of factors was limited to seven because the literature indicated it to be the maximum, and seven different dimensions were used to establish the item pool. Subsequently, the Varimax rotation technique was applied. The decision about whether an item was appropriate for a factor was based on having the factor loading at a minimum of .40. It was also based on having at least a .10-point difference between the factor loading in the closest factor (Buyukozturk, 2009; Tavsancil, 2014). After the Exploratory Factor Analysis, the Confirmatory Factor Analysis was implemented and the factor structure was confirmed.

Testing the Reliability

To test the reliability of the scale, the item-total test score correlation and the Cronbach's alpha reliability coefficient value of items were calculated and examined. The Cronbach's alpha reliability coefficient value is a measure of the internal consistency between the test scores of a scale. The values above 0.70 were accepted as adequate for the test reliability. The item-total test score correlation is used to explain the

relationship between the score of each item and the total score of all test items. The item-total test score correlation was found to be high and positive indicating that the scale has an internal consistency (Buyukozturk, 2009).

Finalization of the Scale

The final version of the scale included five factors and 30 items (Appendix).

Results

In accordance with the analyses, the obtained results are explained in four different steps:

Conducting Item Analysis of the Data

First, the descriptive statistics of the scale of self-regulation skills were examined within the context of item analysis. Because of the implementation of scale, the lowest and the highest scores were found to be 67 and 268, respectively. In this case, the range was 201. This value involves the adequate part of the expected range. The mean score of the scale was found to be 171.78, and its standard deviation was found to be 33.737. The skewness and kurtosis coefficients calculated for the distribution were -0.157 and 0.152, respectively indicating that the data were normally distributed.

The Cronbach's alpha coefficient calculated for the reliability of the scale after the implementation was found to be .937. To determine the extent to which the scale items measured similar behaviors, the item-total correlation was examined, and the items below .30 – 7 items (12th, 14th, 18th, 35th, 36th, 46th, 55th items) – were excluded from the scale. The independent samples t-test was used to find the significance (p) of difference between the item scores of the top 27% and the bottom 27%. It was used based on the study groups to determine the adequacy of each item of the scale in distinguishing individuals. No item was excluded from the scale before the factor analysis, because no items were found with a p value higher than 0.05.

Assessing the Suitability of Data for the Exploratory Factor Analysis

The Kaiser-Meyer-Olkin (KMO) coefficient and Bartlett's test can be used to determine whether the data are suitable for the factor analysis. Thus, it is expected that the results of the Bartlett's test were found to be significant and the KMO value higher than 0.50. The results of Bartlett's test and the KMO value are presented in Table 3.

Table 3

Assessing the Suitability of Data for the Exploratory Factor Analysis

Kaiser-Meyer-Olkin (KMO)		.953
Bartlett's test	Chi-square value	33228.995
	Sd	1128
	p<0.05	.000

As can be seen from Table 3, the KMO coefficient and Bartlett's Sphericity value of 48 items which passed the reliability test were found to be .953 and .000, respectively. The KMO coefficient showed that the sample size was close to perfect, and the Bartlett test result indicated that the obtained data set was suitable for Exploratory Factor Analysis. A significance value lower than 0.05 indicated that the relationship between variables was adequate in conducting factor analysis.

Examining the Construct Validity of the Draft Scale

As a result of the Varimax rotation, items were found to explain 58.204% of the total variance as seven factors. It was noted that the lower bound of item factor loadings was 0.40, and the difference between the two factor loadings of the same item was .10 at a minimum. Items which were not suitable for this criterion (26th, 33rd, 40th, 41st and 54th items) were excluded from the scale. The reliability of 21 items divided into seven factors was examined. The Cronbach's alpha coefficients of the 1st, 2nd, 3rd, 4th, 5th, 6th, and 7th factors were found to be .909, .9, .979, .977, .775, .735, and .402, respectively. Two items constituting the seventh factor were excluded from the scale because the reliability coefficient of this factor was low. To monitor the change, factor analysis was applied again for the remaining items without indicating the factor number. The KMO and the Bartlett Sphericity significant values of the scale (six factors), were found to be .946 and .000, respectively, and the total variance was found to be 59.301%. The items were examined by researchers. Those items that were placed in the wrong factor according to item statements, and those greatly resembling each other in terms of the statement, were excluded from the scale. The final number of items in the scale was determined to be 30 and the factor analysis was conducted again after the above mentioned items were excluded.

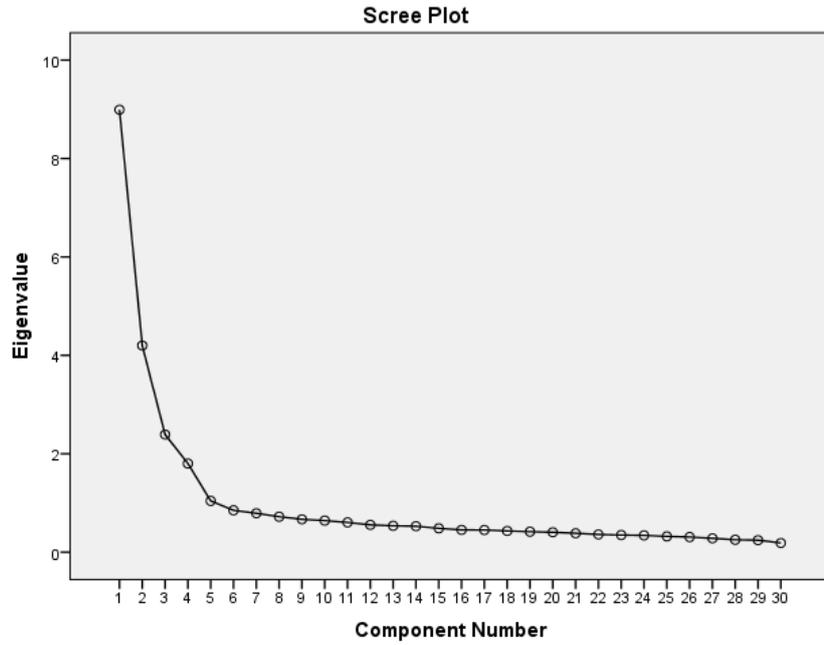


Figure 1. The chart indicating the factor number.

Figure 1 shows that the breakpoint occurred after the 5th factor, and the factor eigenvalue (Table 4) dropped below one after this factor. Accordingly, the scale was found to be a five-factor scale. Table 2 shows that a five-factorial structure explained 61.4% of the total variance. Accordingly, the five factors identified were: goal setting, help seeking, self-study strategies, managing physical environment, and effort regulation.

Table 4

Factor Eigenvalue and Variance

Component	Initial eigenvalues		
	Total	% of Variance	Cumulative %
1	8,992	29,973	29,973
2	4,200	14,001	43,974
3	2,392	7,972	51,946
4	1,801	6,003	57,948
5	1,043	3,475	61,424
6	.851	2,837	64,261
7	.792	2,640	66,900
8	.721	2,404	69,305
9	.669	2,228	71,533
10	.642	2,141	73,674
..

After the determination of the factor number of the scale, the distribution of items across the factors was determined. The item-total scale correlation, common factor variance values, and factor loading values are shown in Table 5.

Table 5

Factor Loading and Item Total Correlation Values of the Items

Item	Factor loading value	Rotated factor loading values correlation value					Corrected item total
		1st Factor (Goal setting)	2nd Factor (Help seeking)	3rd Factor (Self-study)	4th Factor (Managing)	5th Factor (Effort)	
#1 I set my study goals daily.	.581	.768					.525
#2 I set goals for myself while studying.	.582	.723					.523
#3 I study my lessons in a planned manner.	.586	.845					.529
#4 I set goals for myself to arrange my study hours for distance education lessons.	.577	.794					.521
#5 I do not compromise on the quality of what I do for my lessons.	.604	.596					.544
#44 I contact someone to discuss my understanding.	.556		.567				.527
#45 I participate in social media group discussions regarding study subjects.	.467		.704				.450
#47 When I do not understand the distance education course material, I ask another student for help.	.504		.777				.492
#48 I contact other students, who I think are successful, on social media.	.491		.850				.484
#49 I determine what I will ask before receiving help.	.526		.691				.505
#50 I find someone who has information about the course content to consult when I need help.	.532		.718				.513
#51 I share my questions about the lessons with other distance education students on the Internet.	.474		.803				.464
#52 I try to talk face-to-face with my classmates in distance education if necessary.	.422		.724				.411
#53 I insist on receiving help from someone who has information about the course content on the Internet.	.407		.741				.397
#21 I think of questions on the subject while reading the material.	.581			.611			.526
#22 I draw up a draft of reading material to be able to organize my thoughts.	.632			.780			.577
#23 I practice by repeating the contents of the material.	.666			.744			.612
#24 I review my reading materials and notes and try to find the most important opinions.	.647			.667			.586
#25 I create simple schemes, diagrams or tables to organize my study materials.	.588			.740			.532
#32 While studying my distance education lessons, I review my lesson notes and draw up a draft of the important subjects.	.587			.661			.540
#42 I summarize the subjects to understand what I have learned from the lessons.	.631			.660			.576

#43 I evaluate what I understand by pausing at regular intervals while studying.	.647			.546			.595
#6 I prefer studying in places where I can concentrate.	.511				.805		.453
#7 I choose a comfortable place to study.	.447				.803		.391
#8 I have places where I can study efficiently for my distance education lessons.	.519				.615		.458
#9 I choose places where nothing distracts me from studying my distance education lessons.	.493				.888		.435
#10 I study my lessons in places where I can focus.	.526				.870		.469
#11 I have a regular place to study.	.475				.529		.414
#38 I study the course subjects until finishing them even though I find the course materials boring.	.472					.787	.415
#39 I make an effort to understand the subjects in my distance education lessons.	.564					.763	.506

The Confirmatory Factor Analysis was conducted using the AMOS program in order to confirm the factorial structure of the scale. The values which should be examined as a result of the Confirmatory Factor Analysis that was stated in a study conducted by Schermelleh-Engel and Moosbrugger (2003) are shown in Table 6.

Table 6

Standard Fit Criteria

Measures	The best values	Acceptable values
RMSEA	From 0.00 to 0.05	From 0.05 to 0.08
SRMR	From 0.00 to 0.05	From 0.05 to 0.10
GFI	From 0.95 to 1.00	From 0.90 to 0.95
AGFI	From 0.90 to 1.00	From 0.85 to 0.90
CFI	From 0.95 to 1.00	From 0.90 to 0.95
RFI	From 0.90 to 1.00	From 0.85 to 0.90

The values generated after the Confirmatory Factor Analysis are shown in Table 7. According to a comparison of the values determined by the Confirmatory Factor Analysis with the values in Table 5, it can be stated that the values of Root Mean Square Error of Approximation (RMSEA), goodness-of-fit index (GFI), Adjusted Goodness of Fit Index (AGFI), comparative fit index (CFI) and relative fit index (RFI) showed an acceptable fit, while the value of the Standardized Root Mean Square Residual (SRMR) showed a perfect fit. These data appear to confirm the factorial structure of the self-regulation skills scale.

Table 7

The Fit Values of Self-regulation Skills Scale

Measures	Scale values
RMSEA	0.058
SRMR	0.000
GFI	0.892
AGFI	0.873
CFI	0.914
RFI	0.885

Factor loadings of the five factors are shown in Figure 2 which were found as a result of the Confirmatory Factor Analysis. As seen in Figure 2, factor loadings for Factor 1 (goal setting) show variation between .67 and .85; for Factor 2 (help seeking) they vary between .59 and .83; for Factor 3 (self-study strategies) they are between .62 and .77; for Factor 4 (managing physical environment) they vary between .53 and .89; and for Factor 5 (effort regulation) they show variations between .70 and .84. Accordingly, it can be claimed that values of the 30 items in the scale successfully measure the subcomponents of self-regulation; in other words the scale has factorial validity.

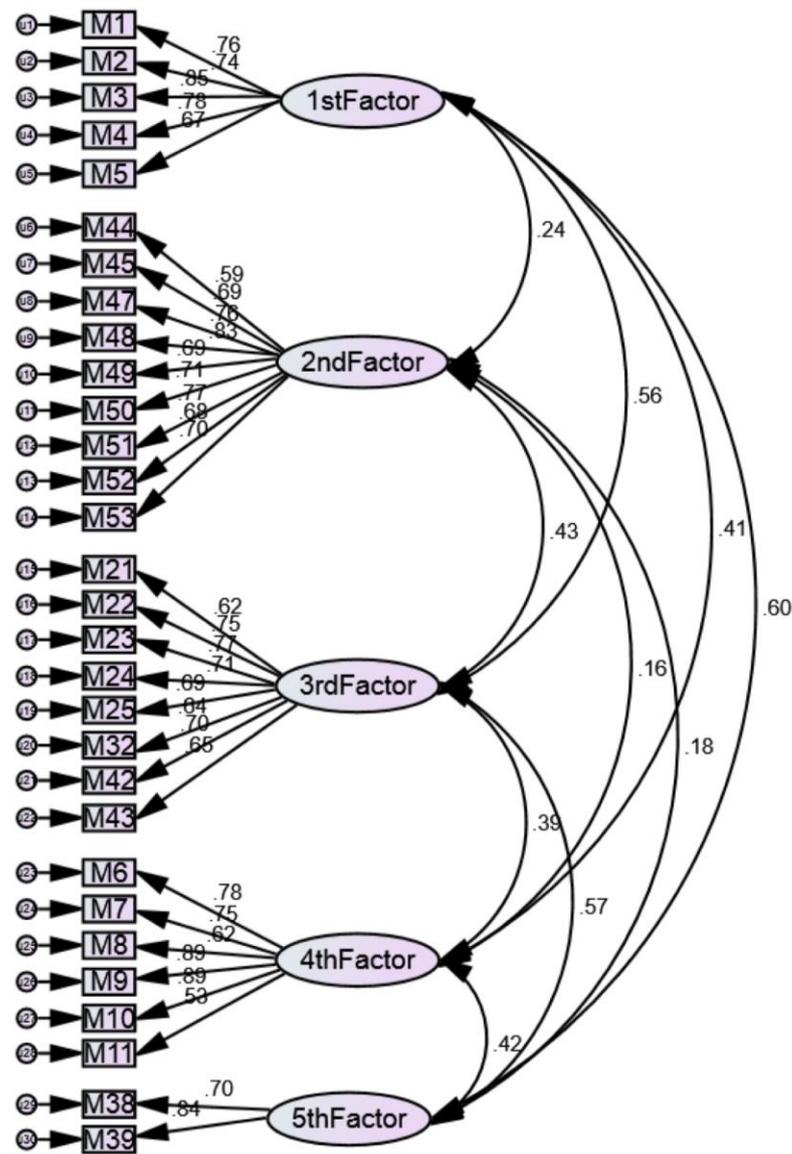


Figure 2. Measurement of self-regulated learning.

Assessing the Reliability of the Draft Scale

As a result of the reliability analyses conducted on 30 items, the Cronbach's alpha reliability coefficient was calculated to be 0.918. Buyukozturk (2009) stated that reliability coefficients higher than 0.70 could be regarded as adequate. The fact that the reliability coefficient related to the scale in the present study was found close to 1 indicated that the reliability of this scale was high. The Cronbach's alpha coefficient was calculated to be .868 for Factor 1 (goal setting); .900 for Factor 2 (help seeking); .879 for Factor 3 (self-study strategies); .871 for Factor 4 (managing physical environment); and .735 for Factor 5 (effort regulation). Regarding this, it was clear that the scale also had a high reliability on the basis of the factors.

Discussion

The aim of this study was to develop a scale assessing the self-regulated learning skills of distance learners who were part of a self-paced distance learning program. Therefore, a 5-point Likert type scale consisting

of 62 items was prepared according to the answers, on the open-ended questionnaire, given by the distance learners based on the literature review and expert opinions. After obtaining expert opinions, seven items were excluded from the scale. Following the testing of the suitability of data for normal distribution using the descriptive statistical method, the reliability of the scale was evaluated, and the Cronbach's alpha coefficient was found to be .937. The items whose item total correlation was lower than .30 were excluded from the scale because items with a total correlation of .30 or higher differentiate individuals very well. The fact that the differences observed between groups in the desired direction were significant indicates the internal consistency of the test (Buyukozturk, 2009). Accordingly, the independent samples t-test was used to determine the significance (p) of the difference between the item scores of the top 27% and the bottom 27%. This was done based on the study group to determine the adequacy of each item of the scale in differentiating individuals. Thus, the items whose p values were higher than 0.05 were excluded from the scale. Subsequently, an Exploratory Factor Analysis was conducted on the remaining items, and the KMO coefficient and the Bartlett Sphericity value were found to be .953 and .000, respectively. The fact that the KMO value was found to be higher than .60 and that the Bartlett value was significant indicated that the data were suitable for factor analysis (Guadagnoli & Velicer, 1988). As a result of the Varimax rotation, the items were divided into seven factors, and the total variance was found to be 58.204%. Since the variance ratio ranging from 40% to 60% is regarded as ideal (Scherer, 1988), it can be stated that the variance quantity obtained in the present study was at an ideal level. Previous studies show that 0.40 can be accepted as the bottom cut-off point for the formation of the factor pattern (Ferguson & Takane, 1989). Moreover, the lower bound of item factor loadings was 0.40, and the difference between the two factor loadings of the same item was .10 at a minimum. The items which did not comply with this criterion were excluded from the scale; the final structure of the scale included five factors and 30 items.

The Confirmatory Factor Analysis was used to test how well the measured variables represent the number of constructs that were obtained through the use of Exploratory Factor Analysis. The Confirmatory Factor Analysis determines whether a structure that was defined and limited before is confirmed as a model, or not (Cokluk, Sekercioglu, & Buyukozturk, 2010). Following the Confirmatory Factor Analysis, the comparison of the values that Schermelleh-Engel and Moosbrugger (2003) suggested and the values obtained from the scale, showed that the factor structure of self-regulated learning skills scale was confirmed.

Five factors including goal setting, help seeking, self-study strategies, managing physical environment, and effort regulation emerged in the scale, which was developed for the distance learners who are engaged in self-study programs (See Appendix). No other scale whose sample group was the same as this scale was found in the literature. Conversely, the comparison of the scale with the scales developed in different sample groups for face-to-face and cohort-based online learning showed similar factors. For example, the factor called *goal setting*, which implies setting aims and targeting results while studying, was also included in the OSLQ (Barnard et al., 2009). This similarity was observed despite the different sample group of the OSLQ and the fact that it was developed completely for online settings. Another factor in the scale was determined as *help seeking*. This factor implies that learners seek help from the Internet and social media, friends, and subject experts. Similarly, the same factor was also included in the MSLQ (Pintrich et al., 1991) and OSLQ scales. Another factor in the scale was called *self-study strategies*. No scale having the same factor was found in previous studies. This factor includes the methods and strategies followed by learners who are studying on their own. Another factor in the scale was called *managing physical environment*. This factor implies that the distance learners organize their physical study environment. Similarly, it was observed that the MSLQ included a time/study environmental

management factor, while the OSLQ had an environment structuring factor. Another factor in the scale was called *effort regulation*. This factor includes the effort made by the distance learners when they have difficulties in studying. A similar factor is also included in the MSLQ scale.

Conclusion

Self-regulated learning is a fundamental element for lifelong learning and a process in which a learner controls, monitors, and affects his or her own thinking process that requires knowledge and skill (Dabbagh & Kitsantas, 2012). Self-regulated learning skills are critical for success in self-paced distance learning environments where learners study on their own. Existing scales that measure self-regulation are not appropriate for self-paced learning. Therefore, a scale was developed in this study to fill in the gap in the literature for measuring self-regulation in self-paced learning environments. The validity and reliability analysis showed that this scale is reliable. The scale can be used to determine the self-regulated learning skills of learners who participate in self-paced courses in either online or traditional distance learning environments such as MOOCs, self-study courses, or courses in open universities. Accordingly, it can be used to determine the activities to be developed for the skills of distance learners. By using the scale, teachers and instructional designers can determine the learning strategies that need improvement. Moreover, educators can use results of this scale to modify the curriculum according to learners' self-regulated skills and personalize learning processes. Besides, researchers can explore the relationship between self-regulation and several factors such as social media use, learning outcomes, achievement, or motivation in self-paced learning environments by using the scale developed in this study.

This study has some strengths and limitations. This scale was developed by the involvement of undergraduate learners enrolled in more than 60 departments with a wide range of age groups from 16 to 69. Therefore, research benefited from maximum variation sampling, which increased the representation of self-paced learners (n=1,279). However, the sample of the study is limited to undergraduate students.

For future research direction, the following implications can be considered by teachers, instructional designers, and researchers. First, it is recommended that further studies, which address different variables in different contexts, should be conducted, and that the scale enlarged to involve different factors. For instance, similar research can be carried out in different cultural settings to see if new items or factors are needed to measure self-regulated skills of the learners. Secondly, future research can focus on measuring self-regulated skills in specific, self-paced learning environments. For example, self-paced learning from the perspective of mobile learning can be examined. Finally, based on the factors identified in this study, teachers, and researchers can work on strategies to develop these skills.

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Appendix

Scale Items

- 5-Strongly agree
- 4-Agree
- 3-Slightly agree
- 2-Disagree
- 1-Strongly disagree

Goal setting

- I set my study goals daily.
- I set goals for myself while studying.
- I study my lessons in a planned manner.
- I set goals for myself to arrange my study hours for distance education lessons.
- I do not compromise on the quality of what I do for my lessons.

Help seeking

- I contact someone to discuss my understanding.
- I participate in social media group discussions regarding study subjects.
- When I do not understand the distance education course material, I ask another student for help.
- I contact other students, who I think are successful, on social media.
- I determine what I will ask before receiving help.
- I find someone who has information about the course content to consult when I need help.
- I share my questions about the lessons with other distance education students on the Internet.
- I try to talk face-to-face with my classmates in distance education if necessary.
- I insist on receiving help from someone who has information about the course content on the Internet.

Self-study strategies

- I think of questions on the subject while reading the material.
- I draw up a draft of reading material to be able to organize my thoughts.
- I practice by repeating the contents of the material.
- I review my reading materials and notes and try to find the most important opinions.
- I create simple schemes, diagrams or tables to organize my study materials.
- While studying my distance education lessons, I review my lesson notes and draw up a draft of the important subjects.
- I summarize the subjects to understand what I have learned from the lessons.
- I evaluate what I understand by pausing at regular intervals while studying.

Managing physical environment

- I prefer studying in places where I can concentrate.
- I choose a comfortable place to study.
- I have places where I can study efficiently for my distance education lessons.
- I choose places where nothing distracts me from studying my distance education lessons.
- I study my lessons in places where I can focus.
- I have a regular place to study.

Effort regulation

- I study the course subjects until finishing them even though I find the course materials boring.
- I make an effort to understand the subjects in my distance education lessons.



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How Learners Participate in Connectivist Learning: An Analysis of the Interaction Traces From a cMOOC

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Abstract

In this research paper, the authors analyse the collected data output during a 36 week cMOOC. Six-week data streams from blogs, Twitter, a Facebook group, and video conferences were tracked from the daily newsletter and the MOOCs' hashtag (#Change 11). This data was analysed using content analysis and social network analysis within an interpretative research paradigm. The content analysis was used to examine the technology learners used to support their learning while the social network analysis focused on the participant in different spaces and their participation patterns in connectivist learning.

The findings from this research include: 1) A variety of technologies were used by learners to support their learning in this course; 2) Four types of participation patterns were revealed, including unconnected floaters, connected lurkers, connected participants, and active contributors. The participation of learners displays the participation inequality typical of social media, but the ratio of active contributors is much higher than xMOOCs; 3) There were five basic structures of social networks formed in the learning; and 4) The interaction around topics and topic generation supports the idea of learning as network creation after the analysis of participation patterns that are based on some deep interactive topic. The aim of this study is to gain insight into the behaviors of learners in a cMOOC in an open and distributed online environment, so that future MOOCs designers and facilitators can understand, design and facilitate more effective MOOCs for learners.

Keywords: participation pattern, cMOOCs, social network analysis, connectivist learning, connectivism, interaction

Introduction

MOOCs have attracted worldwide research and practice attention from a variety of entities including government, university, enterprise, and other stakeholders (Riel & Lawless, 2017). Downes (2012a) classified MOOCs into those based on transmission of information (xMOOCs) as differentiated from cMOOCs in which participants collaboratively discover and generate new knowledge. The developments since the first x and c MOOCs were first introduced more than 10 years ago, have witnessed the continuing growth of xMOOCs offered by institutions and both for-profit and non-profit companies. The xMOOC model is now much more familiar to learners and teachers in that they often use systems developed for more traditional online courses and use a predominance of micro video lessons and machine marked quizzes for student feedback. xMOOCs have been criticized as not providing sufficient learner support and engagement, however, they have shown capacity of scale, and over their evolution, have added a variety of more novel assessment activities and learning activities including games and simulations (Hew, 2016). cMOOCs have been much less popular, though proponents continue to note that they provide much greater opportunity for student agency, network literacy development and collaborative learning opportunities. Critics of cMOOCs have noted that students encounter “difficulties in way-finding and sense-making because of their lack of necessary knowledge and skills” (Li, Tang, & Zhang, 2016, p.3) and also often suffer from information overload and unfamiliarity with the learning model being used by instructors that is exacerbated by the information flow from many sources that characterize cMOOCs. As a response to these criticisms, some researchers have been incorporating elements from both types of MOOCs in course design, creating hybrid models (Ostashewski, Howell, & Dron, 2016; Siemens, 2014; Crosslin & Dellinger, 2015). Fidalgo-Blanco, Sein-Echaluce, and García-Peñalvo (2016) combined the use of a number of social networks with a single xMOOC platform and found higher course completion rates and learner satisfaction using this hybrid model. If we are to build complete cMOOCs using distributed technologies or add social networking tools to more traditional xMOOCs we need to understand the types of tools chosen by users and the network structures that emerge when using these tools.

Siemens states that learning is a process of connection and network formulation (Siemens, 2005b). These networks include neural networks, concept networks, and external/social networks. Obviously the study of neural networks is far beyond the expectations of this research. However, here we examine how learners’ participation in a cMOOC is distributed across learning environments from the social network and concept network perspectives. Because connectivist learning is often supported by various distributed technologies, the research questions are therefore: 1) What kind of technologies do learners use to support their learning? and 2) What kind of participation pattern and network structures are formed among participants and topic during their learning based on learners behavior? Fournier and colleagues (2014) noted that cMOOCs have large, incomplete, and dispersed data sets, so research of participation in cMOOCs is challenging due to the complex and distributed characteristics of this kind of learning. This research intends to help us have a deeper understand of the participation pattern of learners from different perspective with empirical data generated in a cMOOC. We believe that the exploration of learners’ participation patterns in cMOOCs will be helpful for future MOOC designers (either cMOOCs, xMOOCs, or hybrids).

Related Work

The Development and Innovation of cMOOCs

Pioneers of Connectivism, George Siemens, Stephen Downes, and other connectivist learning researchers developed and ran a series of Massive Open Online Courses to put their idea of Connectivism into practice from 2008, such as CCo8, CCK10, CCK11, Change 11 MOOC, Openness in Education, etmooc, REL2014, Rhizo15, etc. Among these courses, the Change 11 MOOC had the longest duration and lasted for one and a half years. At that time, MOOCs were known throughout the whole world for the very successful MIT xMOOC course Artificial Intelligence. Thus, Change 11 MOOCs occurred not only at the initial peak of cMOOC development, it was also casually referred to as “the mother of MOOCs” (Siemens, 2011a). MOOCs have since been developing for 10 years. Though many other kinds of MOOCs were proposed and developed, such as sMOOC, MOOR, SPOC, etc., the two main types of MOOCs are cMOOCs and xMOOCs, and the design pedagogies have remained with significant differences (Daniel, 2012; Wang, Chen, & Zhen, 2014). As Siemens noted, “the cMOOC emphasizes creation, creativity, autonomy and social networking learning, so it focus on knowledge creation and generation, whereas xMOOCs emphasizes a more traditional learning approach through video presentations and short quizzes and testing, so it focus on knowledge duplication” (Siemens, 2012, para. 3). MOOCs have been discussed and researched extensively in the field over the past five years (Riel & Lawless, 2017). Though there are some innovations of xMOOCs compare with those in 2012 with a linear instructor-led approach, such as designed peer assessment, team-based learning, and social interaction activates in the course, there are some innovations of cMOOCs, or especially Change 11 MOOC that these xMOOCs did not have.

Learning and interactions in cMOOCs are distributed and multi-spaced (Siemens, 2013) as compared with traditional courses offered either in classrooms or online. Learners are able to, and encouraged to, control and shape their learning experiences in cMOOCs – even to the extent of collaboratively defining the curriculum. The design pedagogies and learning objects used and created are based upon learner input and participation. In an xMOOC, the learning interactions take place primarily on a course page or single LMS type system. In a cMOOC, contributions occur and emerge in many distributed online spaces, including blogs, Twitter, Facebook, Wikis, Google Groups, Second Life, YouTube, and dozens of others adopted by learners (Wang, Anderson, Chen, & Barbera, 2017). Learners joining cMOOCs should be self-directed with high network literacy and autonomy to learning successfully, and they also should be network-directed learners (Siemens, 2011b; Downes, 2011a) to help them create a personal learning environment and collaborative learning environment for the whole participants – if not they can feel overwhelmed in such a complex learning environment. What is more important, they should be knowledge discoverers and creators in the learning process.

So, we argue that more attention should be focused on cMOOCs and their exploration of interaction and network creation centered on learner-learner interaction and on learners’ networked knowledge creation and growth (Downes, 2012b; Siemens, 2011c). Learning analytics is used under both MOOC models and is designed to reduce “big data” largely obtained from traces of learner activities into meaningful analysis (Merceron, Blikstein, & Siemens, 2016). A key research issue is how to gather and analyse critical behavior data in the information flow of a learning activity and how to analyse and interpret individual learning

behavior characteristics. This study explores and analyses participation patterns based on the interactive behavior traces left across the internet.

cMOOCs Participation

Researchers and learners interested in Connectivism and the emergent MOOC phenomena joined in the learning of these cMOOCs as participants. A variety of research studies have emerged from this landmark series of cMOOCs. These include the following perspectives: the delivery model innovation introduction of a cMOOC (Fini, 2009; Rodriguez, 2013); Personal Learning Environment design and development with distributed technologies (Kop, 2010; Fournier, Kop, & Durand, 2014); learners participation and learning experience (Saadatmand & Kumpulainen, 2014; Smith & Eng, 2013; Levy, 2011; Kop, 2011; Mackness, Mak, & Williams, 2010), and a focus on facilitators' experiences (Arnold, Kumar, Thillosen, & Ebner, 2014). Some studies (Siemens, 2011c; Milligan, Littlejohn, & Margaryan, 2013, 2013; Skrypnyk, Joksimović, Kovanović, Gašević, & Dawson, 2015; Bozkurt et al., 2016, Wang et al., 2017) relate directly to the pattern of interaction and communication observed in these connectivist learning environments. However, in Milligan and his colleagues' research, the number of participants interviewed is limited compared with the massive number of learners enrolled in the course. What is more important is that these studies divided participant in cMOOCs into three patterns: active participation, passive participation, and lurking. These three types of learners have been identified in online community and distance and online learning for a long time. However, the number of passive learners did not fully match with the educational goal of connection building and collaborative knowledge creation and generation (Siemens, 2013) espoused in connectivist learning. Siemens' research focused on the orientation in complex online learning environments and analysed only the data generated in a single CCK o8 forum, which was only a small part of all data generated in the course. Skrypnyk and colleagues (2015) conducted a social network analysis of Twitter-based course interactions in a cMOOCs to explore the roles of course facilitators, learners, and technology in the flow of information. This study deeply analysis the socio-technical network of human participants and hashtags, and represented the technological affordances for scaling course communication (Skrypnyk et al., 2015, p. 188). Bozkurt and colleagues (2016) analysed interactions, community formation, and nomadic learner behavior in Twitter for a six-week long MOOC within a social network and Community of Inquiry framework. These studies have shown us how learners participate in cMOOCs from the information flow and community formulation perspectives; however, just as the author reported in their study, their limitation was that they only focused on the interaction in Twitter (Skrypnyk et al., 2015; Bozkurt et al., 2016). Though Twitter is one of the main media adopted by most participants, the cMOOC was also supported by the course website, blog, Facebook, and many other technologies. The deepest interaction occurred in the distributed blog websites and these data cannot be ignored (Wang et al., 2017). In earlier work, using deductive analysis of qualitative data, we developed a framework for cMOOC analysis, which we called the Interaction and Cognitive Framework (ICF) (Wang, Chen, & Anderson, 2014; Wang & Chen, 2015). The main patterns in four levels of connectivist learning interactions were recognized and described in this work (Wang et al., 2017) with a whole- and macro-perspective analytic lens by qualitative study; however, connectivists argue that learning is a connection-building and network-forming process (Siemens, 2005a, 2005b), We have focused this study on research from a network-building perspective. As Fournier and colleagues (2014) stated, cMOOCs have large, incomplete, and dispersed data sets. This presents many challenges to researchers. This study was conducted with an interpretivist research paradigm, and attempts

to collect as much data as possible in a distributed, multi-technology supported environment to identify how learners participate in their learning during cMOOC courses.

Methodology

Course Selection

As mentioned above, researchers have organized dozens of cMOOCs in the past 10 years. This study selected the Change 11 MOOC as a case because it was referred as the “Mother of all MOOCs” by some participants and can be viewed as a defining model of cMOOCs implementation. This course was the fourth courses developed by these MOOC pioneers and thus benefitted from their earlier experience organization with cMOOCs. This course was co-facilitated by Dave Cormier, George Siemens, and Stephen Downes, and lasted from September 10, 2011 to May 28, 2012 (36 weeks). It was designed to introduce and discuss the changes happening, and projected changes that will occur, within formal education. Each week an invited expert facilitated a live session using with synchronous technology and recorded for an asynchronous presentation and review at a later time. Participants were encouraged to reflect, interact, and undertake knowledge creation, based upon the topics generated by this session and the comments and views of other participants, including the facilitators.

Data Collection and Analysis

Unlike most xMOOCs, and blog or wiki based cMOOCs, the interaction and learning data in Change 11 MOOCs was distributed across different Web 2.0 technologies and digital platforms. The hashtag *#change11* was defined by course facilitators and used by most participant. Much of the participants' contributions were discovered using the hashtag and was collected and distributed by a tool called gRRShopper (See Figure 1). This content was aggregated into a daily newsletter and was sent to all participants by email, RSS, and archived on a course website.

This study collected data from the daily newsletter in gRRShopper post and followed the *#change11* hashtag to track the interaction the learning flows distributed across the network. This course lasted 36 weeks and more than 2000 people interacted in many different spaces, thus it was impossible to comprehensively analyse all data generated in the course (Wang et al., 2017). An analysis of the number of topics generated in the main spaces showed that week one to week six were the most active portion of the cMOOC and thus this was selected as the focus of our data analysis.

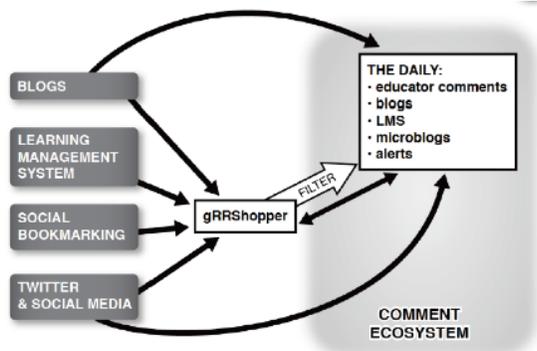


Figure 1. Structure of daily newsletter.

To ensure that all data was collected consistently in the same space, different data collecting rules were defined. We made a detailed introduction to our data collection strategies in our former study (Wang et al., 2017). In summary, we itemized the different technologies used for participation and if the technology was used by other participants. These technologies were aggregated to explore the full technology network of the course.

For the learners, as well as the researcher, the distribution of interaction across multi-online learning environments, supported by various technologies, using different usernames, and distributed databases, made it challenging to combine these feeds, produce meaningful learning, and research information. Thus, this study uses social network analysis as the main research methodology. From our earlier work we found learners participate on blogs and Twitter most often but they also joined in an assortment of synchronous and asynchronous learning groups created by both other learners and the facilitators. Given the greater accessibility of the blog (daily newsletter based) this and Twitter (with hashtag# change11) were chosen as data sources for this study. NodeXL, an open-source social network analysis tool (Bonsignore et al., 2009), that was used for the social network analysis in this study.

Learner behavior in such heterogeneous learning environment(s) supported by different technologies, varies in format, content, and intensity. The coding and analysis rules in the network analysis depended upon the learning behavior supported by a specific technology. For example, the blog based daily newsletter, served content from many online tools designed by different companies and using different formats. Some blog posts included data about the number of shares, likes, and comments posted by readers. However, they did not reveal the identity of these responders nor if they were also enrolled in the MOOC or not. In an attempt to arrive at consistent and valid data, I ignored this data and used only common features of all blog posts, such as post, reply, and linked by others blog. The final social network coding rules are as follow:

- If participant A posted a new blog post, this was defined as an interaction of this participant to all people in the MOOC and distributed both from the original site and in the daily course newsletter. We defined a role “all” to statistics of original new postings. The code was A to all.
- If B replied to A’s posting, the coding is B to A .However, if B forwarded the response using @D in the reply post the coding was B to D.

- If C made a reply to B's replying posting, the coding is C to B.

Since the structure of blog are different, we used manual coding in the study. The data were checked and revised by manual and NodeXL to assure the validity.

There was a total of 6030 interaction data (including post and comments) nodes in for social network analysis, showing as table 1.

Table 1

Interaction Data (Posts and Comments) of Each Week in Different Spaces

	Blog	Twitter	Facebook group
Week 1	311	664	509
Week 2	462	559	293
Week 3	390	440	211
Week 4	404	407	178
Week 5	181	280	51
Week 6	459	231	126
Total	2207	2581	1242

Finding

This study analysed how learners participate in the cMOOCs from the four different aspects: (1) the technology learners adopted to support their learning; (2) the participation categories formed in the course; (3) the social network structure formed in the different digital spaces; and (4) typical participation patterns based on deep interactive topic.

Technologies Adopted by Learners to Support Their Learning

In our previous study, we found that learners must first learn how to use different social network technologies to establish and maintain their personal network environment (Wang et al., 2017). Thus, this study identifies which kinds of technologies learners used to support their learning to deepen our understanding of the learning technology challenges to be expected by learners and teachers.

Though course facilitators only officially supported the course website email and Twitter at the beginning of the course, after a week's learning, a variety of technologies were adopted and distributed by participants. These technologies including: 1) video present technology (YouTube, Blip, tumblr); 2) blog technology (wordpress, blogspot, edublogs, saadatm); 3) source aggregation and sharing technology, abbreviated as SAS (Google+RSS, typepad, Scoop it); 4) wiki (wikitionary, wikispace); and 5) other technologies as Google Docs, email, and personal web sites. Besides the technologies above, learners spontaneously built several group spaces for their learning, such as a Facebook group, Diggo group, Open study group, and Google group. As the course proceeded, additional technologies were trialed and/or adopted. The final technology map of six week is visualized in Figure 2.

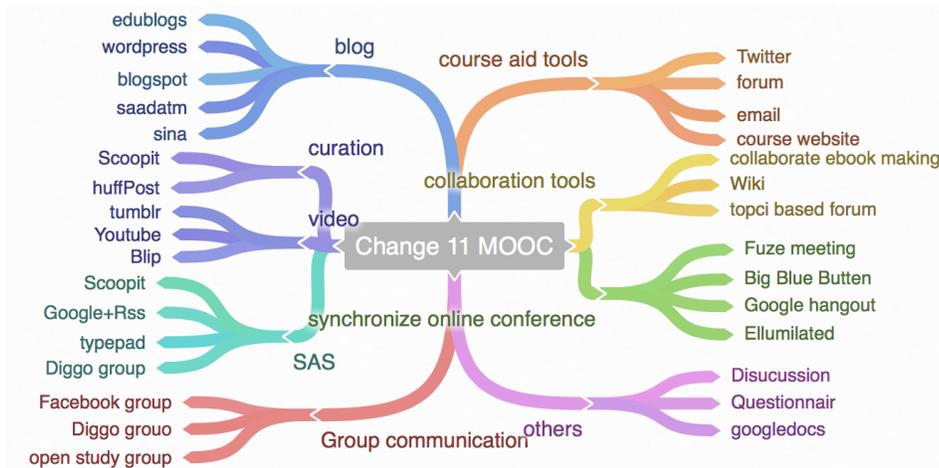


Figure 2. Technology learner used to support their learning in Change 11 MOOC.

Though many other technologies were adopted by some learners, the main technologies used collaboratively during the course were personal blogs, Twitter, and some group communication technologies such as Facebook group and Open Study group. Considering the needs (and challenges) of data accessibility, this study selected interaction traces based on blog, Twitter, a Facebook group, and synchronized audio/video conferences for further analysis.

Participation Categories

cMOOCs are designed to build a complex information environment for all participants using learner-driven learning artifact creation, and remixing, reflection/summarization, discussion/negotiation, information aggregation, and sharing on course themes (Wang, Chen, & Anderson, 2014). As mentioned above, learners should have high degree of autonomy (Skrypnik et al., 2015) and should be self-directed and network directed in this kind of course. If the learners did not make contributions (such as post blog, comments, information sharing, and aggregation on themes) to the course, the course can hardly be described as a cMOOC. This hyper participation and contribution to the content is different from xMOOCs, where the vast majority of content is created and presented by instructors only.

Table 2 lists six categories of the number of people participating in Change 11 MOOC from the first week to the sixth week, including the number of registered, daily newsletter subscribers, number of blog feeds generated, the topic generated and number of participants involved in blog, Twitter and Facebook group interactions. The first three rows were obtained based on the participant data of week 1 to week 6 published by Downes (2011b), and the later three items were retrieved from social network analysis of transcripts in the course. The open and distributed characteristics of blog, Twitter, Facebook group, and the functional design of these technologies preclude our obtaining data related to how many people read these interactions. Thus, the three rows of data are retrieved from the transcript of interaction data left in these spaces by social network analysis.

As Table 2 shows, this course attracted more than 1300 registrations, and almost everybody who registered the course also subscribed to the daily newsletter at the beginning of the course. In these six weeks, the

number of people registered in the course, subscribing to the daily newsletter, and generating blog posts increased over time. At the sixth week, more than 2000 people had registered in the course, and the cMOOC had attracted worldwide attention. Each week, from 100 to 200 topics were generated by the participants based on the content the facilitators provided.

Table 2

Number of Participants in Different Spaces Each Week

	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6
Registered number	1774	1892	1940	2013	2079	2130
Daily newsletter subscribe number	1714	1807	1832	1884	1931	1972
Blog feed recipients number	192	216	231	241	252	258
Blog posts number	138	202	160	156	84	151
Twitter posts number	294	246	294	236	215	166
Facebook group posts number	171	121	57	52	32	61

Despite the steady increase in registrations, the number of people participating and interacting in the daily newsletter, Twitter, and the Facebook group showed a strong randomness, and did not increase with the increase in registered participants.

Other MOOC researchers have divided learners into different types (Hill, 2013; Milligan et al., 2013), such as active participation, passive participation, and lurking. Milligan and his colleagues (2013) and Hill (2013) added drop-ins as the fourth type for those “who are partially or fully active for their specific learning needs” (Hill, 2013, The Four Student Archetypes section, para. 4). However, cMOOCs are designed within the pedagogy of connectivism which proposes that learning is a network creation. This creates both a challenge and an opportunity for learners to participate in the course, so we divided learners using the lens of connectivism and combined it with a particular course design.

As described in Table 1, there were four categories of interactive behavior.

1. Unconnected floaters: These participants registered in the course thus showing their willingness and intent to participate but did not subscribe to the daily newsletter. They can only receive information of the course through course website as in xMOOCs, and did not likely get the latest information of the course by email or blog post on time. According to our cMOOC pedagogical design, they are labeled as unconnected floaters.
2. Connected lurker: These learners followed the course through the daily email newsletter, but did not make contribution (create new learning artifact or interact with others) to the course.

Interaction with the content by subscribing to the daily newsletter was the primary (and most often only) connection with the course, though they may have forwarded the email or privately interacted with other participants enrolled or not in the course. However, these lurkers, potentially including the ones having deep interaction with the content by independent study, did not have social interaction with others.

3. **Connected participant:** A cMOOC uses an interaction-centered design. Connected participants actively engage in the course and share their participation activities. In this course, they not only subscribed to daily newsletter, contributed their blog feeds to the course, and also made blog post and comments on the selected themes and topics they were interested in on the main interaction spaces, such as blog, Twitter, and the Facebook group.
4. **Active contributor:** These are the participants who not only connect with content actively, but also contribute their knowledge by creating learning artifacts. In this course, they are the one who actively post blogs to express their views and make comments on others' ideas on the themes and topics each week. They are long-standing residents in the course, and can often be found on all main learning spaces supported by different media. This type of learner is rarely seen in other MOOCs.

While analysing the participation pattern of learners in the course, we found that the number of learners in each of the categories above followed a similar pattern to interaction in many online social systems (Nielsen, 2006). More than 93% of those registered subscribed to the daily email newsfeed, 12% of them contributed their blog feeds, and between 4.04% and 10.78% of them contributed content that was redistributed in the daily newsletter each week during these six weeks. If we change the total number into 100 and use the average ratio in blog based daily newsletter and Twitter, the ratio of four categories of participant is 2 unconnected floaters, 78 connected lurkers, 11 active contributors, and 9 active contributors. This is described as Figure 3.

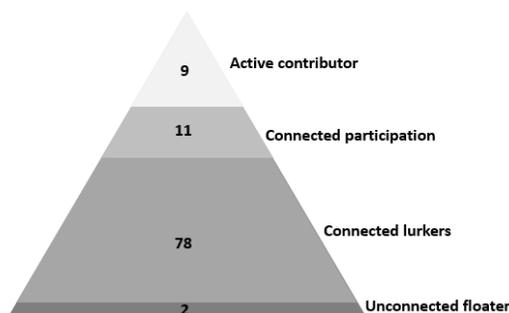


Figure 3. Participant inequality in Change 11 MOOC.

Social Network Structure Formed in Different Spaces

Connectivism claims that learning is a process of building both inner neural networks, and external conceptual networks and social networks (Siemens, 2005b). At the beginning of the course, the participants were isolated, but as the course proceeded, deeper connection were built among them through these

interactions. In this cMOOC, learners formed a large social network in the course. The structure of social networks looks slightly different in the blog, Twitter, and Facebook group due to unequal participation in each. Because of the different degrees of openness, ownership, and technical affordances, each technology played a different role in supporting this kind of learning.

Using the blog based interaction in the first week of the course as an example, Figure 4 illustrates the social network layout with the Harel-Koren (HK) fast multi-scale algorithm, which is one of NodeXL's two force-directed algorithms.

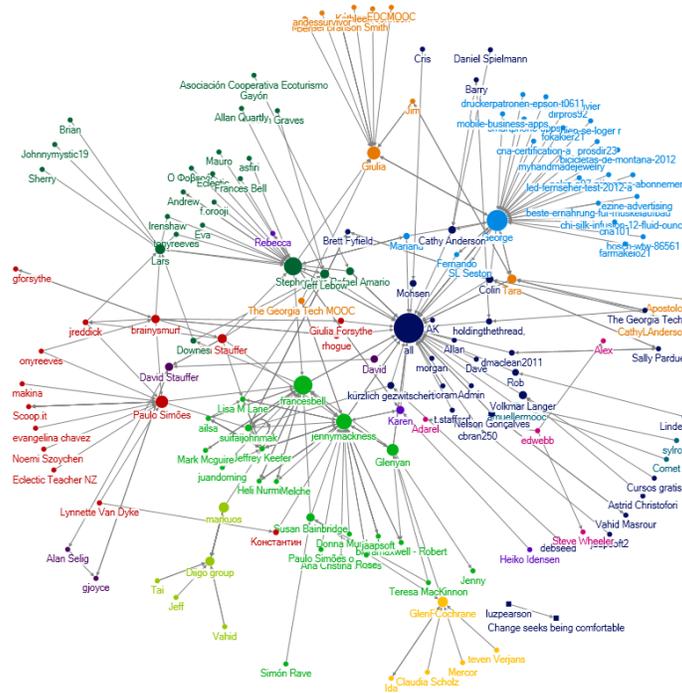


Figure 4. The social network of the first week blog based interaction

Table 3 represents a view of this social network with 309 edges, 143 nodes in the network. That means there are 309 interaction among these 143 nodes. There are five special (particularly central) nodes in the network: all, eduMOOC, The George Tech MOOC, Diggo group, and Soop.it. The node “all” is defined to count how many people submit original blog post to the course. The in-degree node “all” is 33, which is also the maximum in degree of the network, and the edges of “all” is 48. That means 33 people contributed 48 original blog post to the course. The node “eduMOOC” and “The George Tech MOOC” represents other MOOCs connected within the course, and the node “Scoop it” is a curation technology participants adopted in their learning. The node “Diggo group” represents a group build by some participants to aggregate information. So, 138 participants joined in the blog based social interaction in the first week. The maximum out-degree of this social network is 11. It belongs to the node “jennymackness,” who is a learner in the course. The maximum intermediate centrality of this social network is 5397, it belongs to node

“George,” who is one of the facilitator in the course. So, the facilitator played an important communication role among participants in the first week of blog based interaction.

Table 3

The Overall Metrics of Social Networking in the First Week of Blog-Based Interaction

Nodes	Edges	Self-loop	Maximum in degree	maximum out-degree	Maximum intermediate centrality
143	309	4	33	11	5397

Social network researchers have noted that “types and patterns of relationships emerge from individual connectivity and that the presence (or absence) of such types and patterns have substantial effects on the network and its constituents” (Mika, 2007, p.27). In order to detect the network structure, we use the Clauset-Newman-Moore algorithm to cluster this social network first and then stratified it. As Figure 5 shows, 13 groups and 6 network structures were formed. The largest group is “all,” and most nodes in that group are connected with nodes in other groups. There are five isolated nodes (admin, bioram, Dave, demanclearn11, Morgan) in the network connected with the node “all.” The six network structures can be described as star structure (A), network structure (B), self-loop structure (C), triangle structure (D), bridge structure (E), and isolated structure (F). Star structure (A) is the main structure of the network. In this network, groups of George, Guilia, Stephen, Paulo Simões are star structure networks. These nodes are the center of these small networks. Network structure (B) is complicated - there is no center among these nodes and there are many interactions among these nodes; many complicated interactions happened among the nodes. Self-loop structure (C) illustrates those who wrote comments on their own blog post as to provide further information and reflection. Triangle structure (D) is the structure connected with two or three main nodes. Bridge structure (E) is a linear structure; if one of them is not connected, this network cannot reach other nodes. Isolated structure (F) is the one isolated network among two or three nodes. The nodes of these structures did not connect with other groups or nodes.

As Figure 5 illustrates, multi-interaction centers were formed following a high sequence of interaction. The participants in the center not only have a deep connection with other participants in other centers, but are also connected with many participants who were relatively isolated in the course. They acted as the “obligatory points of passage” in Actor Network Theory (Latour, 2005) in this network, because the important information in the network will flow to these centers and be amplified by them.

How Learners Participate in Connectivist Learning: An Analysis of the Interaction Traces From a cMOOC
Wang, Anderson, and Chen

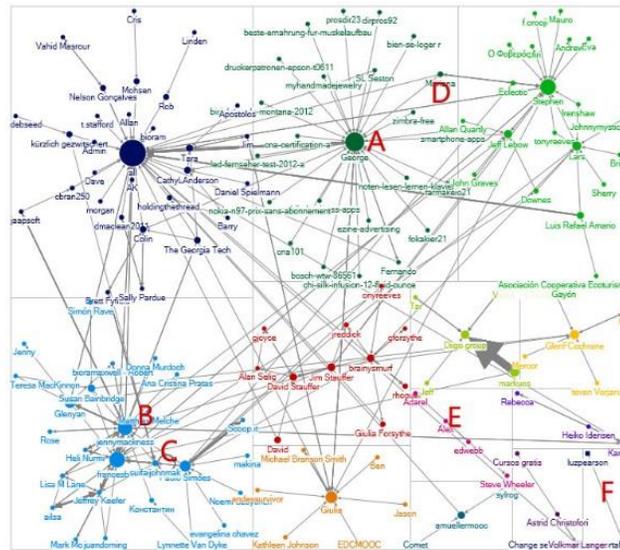


Figure 5. The structure of the social network in the first week from blog based interaction.

Typical Participation Pattern Based on Deep Interactive Topic

As Downes (2007) argued, learners should be active participants in content generation and interaction to maximize their own learning. Learners not only interacted with other learners, but also participated in content creation in this course. Table 4 lists the total number of posts and interactions in the blog, Twitter, and Facebook group in six week. All participants in this course generated 1176 original blog post, 2516 original Twitter post, and 511 original Facebook group posts in the sixth week of the course, and the interaction behavior based on these original posts is two times greater than average number of posts. This may support the claims that cMOOCs is an interactive, emergent, and creation-based course. The average number of interactions on each topic in the blog and Facebook are more than those generated on Twitter; however, the total post and interaction number in Twitter is much higher than the other spaces. This is probably because posting a Twitter is much faster and easier than creating a blog post and Facebook message.

Table 4

The Number of Posts and Interactions Generated in Different Spaces Each Week

	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Total
Blog post	113	158	242	284	158	221	1176
Blog interaction	311	476	388	401	179	667	2422
Twitter post	517	559	512	423	283	222	2516
Twitter interaction	713	511	743	604	445	369	3385

Facebook group post	228	99	55	43	17	69	511
Facebook group interactions	546	291	211	176	49	124	1397

From Table 4, the number of interactions in each space is almost two times the number of related original post in these spaces. At first glance, the interaction in the course is not heavy. That is because in nearly 50% of the postings there were no replies posted. We can speculate that this is related to the perception that the content is too simple, too obscure, too easy, or did not create anything new; it was written in other languages than English; or that it overlapped with other content and information in this complex information environment. However, some high quality topics had intensive interaction and debates, during the learning process, and even inspired some new topics. For example, one participant posted a blog “Orienting myself to the Change 11 MOOC” in his blog site. Twenty-one participants made 33 comments on it including 28 deep discussions under the blog, and five pingbacks from Scoop it and other blogs. When tracking the interaction data further, we found that three new topics were generated over the course and one of these generated yet another new topic. Figure 6 presents the name of topic and their relationships. It is a prototype of the conceptual network formed in the course.

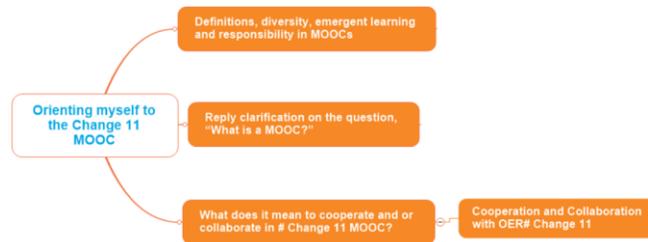


Figure 6. Topic generated base on the “orientation myself in MOOCs” post.

What is more important is that all these topics lead to further discussion in other blog spaces with other participants. The number of comments and pingbacks (a new blog post, in response to the original post) from each topic are listed in Table 5.

Table 5

The Interaction Data Based on the Generated Topic

Topic	Poster	Interaction data
Orienting myself to the Change 11 MOOC	Francesbell	35 comments;5 pingbacks
Definitions, diversity, emergent learning, and responsibility in MOOCs	Jennymackness	20 comments; 4 pingbacks
Reply clarification on the question, “What is a MOOC?”	Jeffrey	7 comments; 2 pingbacks
What does it mean to cooperate and or collaborate in # Change 11 MOOC?	Suifaijohnmak	8 comments; 5 pingbacks
Cooperation and Collaboration with OER# Change 11	kürzlich gezwitschert	1 comments; 1 pingbacks

Not only was a concept network formed, but also a social network around this topic emerged. Figure 6 and 7 illustrated the topic network and social network formed around this topic through participant’s interactions. These two networks based on one generated topic are only a small part of the whole social and concept network of this course. It provides an example of Siemens oft-quoted description of “learning as network creation” (Siemens, 2005b, Abstract section, para. 1).

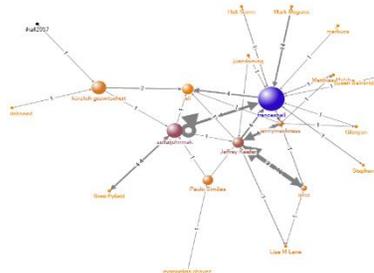


Figure 7. Social network of the topic “orientation myself in the MOOCs.”

Conclusion and Discussion

This study explored learners' participation in a connectivist learning context from the perspective of the technology adopted by learners, the participation categories that emerged, the social network structure formed, and a typical conceptual network that was formed based on topics in the course. After the analysis of six weeks' interaction transcript in Change 11 MOOC, we get a clearer picture of learners' participation in this kind of learning.

1. A large and diverse technology map was formed in the course. The eight categories of technologies map in this course include all five kinds of affordances of social software tools proposed by McLoughlin and Lee (2007): connectivity and social rapport, collaborative information discovery and sharing, content creation, knowledge and information aggregation, and content modification. Each technology played a slightly different role in the course based on their main functions, affordances, participant competence, and usage in supporting learning. This supports the idea that "learning occurs in a socio-cultural system in which learners use various tools and multiple forms of interaction to create collective activity, supported by technology affordances" (McLoughlin & Lee, 2007). Further that "technology is an enabler of new opportunities" (Siemens, 2009, p. 2); each technology can create a different learning space for the learner. In this course, students were given freedom of choice to select different kinds of technologies to support their learning according to their individual and collective interaction preferences, technology and bandwidth availability, and technology affordances. Everyone can build their own learning spaces and group learning spaces in this kind of course, which also makes it is possible to connect with different learners in and outside of the course. Through the contribution and participation of every active learner, a complex technology environment, for both individuals and collective networks, was formed through the course. As Weiser (1991) stated that "(t)he most profound technologies are those that disappear" (p. 94). We argue that the best technology in learning is the one that has disappeared in learning. It follows that we should, and can, allow and support student trialing, use and adoption of the technology they find most useful for their learning and thus build their own the personal learning environments. Through analysis of this data, we found that there are differences among the number of participant in the use of various technologies. The largest number of learners were involved in Twitter-based posts and interactions. Less were involved in blog-based social interaction; 270 of them registered in the Facebook group and 40-60 joined in the online video conference. This supports the idea that we proposed in the Connectivist Interaction and Engagement (CIE) framework that: the higher the cognitive engagement required, the less participants will participate (Wang, Chen, & Anderson, 2014). The limit of 140 words of Twitter, makes it is easy and fast to edit and does not require higher levels of cognitive engagement - thus participants can easily participate. The aggregation of blogs distributed using the daily newsletter was the main learning resources generated in the course for learners, and 92% register subscribed to it. However, active participation in this kind of blog-based interaction requires deeper cognitive engagement compared with interaction in other spaces. Perhaps because the blog can express more ideas in one post than Twitter, so the number of average interactions arising from one blog post is more than those from a single Twitter post. The Facebook group established by a participant attracted a much smaller learner group, so the interaction in it was also less than other technologies.

2. We divided learners' participation in the course into four categories, according to their participation patterns in the course. These are unconnected floaters, connected lurker, connected participant, and active contributor. The ratio of these four types of learners are 2 unconnected floaters, 78 connected lurker, 11 connected participant, and 9 active contributor. Nielsen (2006) proposed "the 90-9-1 rule for participation inequality in social media and online communities," which means that "in most online communities, 90% of users are lurkers who never contribute, 9% of users contribute a little, and 1% of users account for almost all the action" (Nielsen, 2006, para. 4). Clow (2013) also proposed a funnel of participation in xMOOCs - the number of participant decreases from awareness, to registration, to activity, and progress. As illustrated in Figure 4, these two principals were supported in the Change 11 MOOC. However, the active contributors in Change 11 MOOC is much higher than the 1% active participant in most online communities. Lee (2012) found that students read many peer's postings but selectively responded only according to their interest. Though learners' participation in Change 11 MOOC still supported Lee's conclusions, the frequency and number of posts and responses of others post is much higher than in xMOOCs. The design pedagogy likely influenced this difference. In this sense, Change 11 MOOC was a successful course that had more active participation than that observed in more general, less focused, and informal online communities.

Although we do see a participation model that is roughly similar to other MOOCs and online communities, these four categories have different meaning than other studies. The "active participant" in other MOOCs are those who make active contribution in the course discussion forum is just a part of "connected participant" in a cMOOC. It is hard to find the active contributor of other xMOOCs and online courses as we defined in this study. This can be supported by the empirical research that use the interaction analysis model for social construction of knowledge developed by Guanawardena, Lowe, Constance, & Anderson (1997), that divided the interaction into five levels (Sharing/comparing of information; discovery and exploration of dissonance or inconsistency among ideas, concepts or statements; negotiation of meaning/ co-construction of knowledge; testing and modification of proposed synthesis or co-construction; agreement statement application of newly constructed meaning). They found that it is hard for students to reach the fourth and fifth levels, thus, more research should be done by comparative study of these different categories of participants among cMOOCs, xMOOCs, and other online learning communities.

3. This study identified six basic structures of social networking formed during learning and found out that participants played a different role compared to traditional courses or xMOOCs. Indeed some participants played more active, and arguably more important, roles than the facilitators. The center of these emergent social networks was always changing as the course moved along. It is interesting to find that facilitators' central position in the network is not obvious - many participants played an equally (sometimes more) important role than facilitators. In the selected three spaces, we found that facilitators were more active in Twitter than the blog, and it is difficult to even identity their presence in the Facebook group. The ones who make high quality posting and

important information (based upon number of responses or comments) or those that join in deep interaction with more than a single topic can play key roles in the network.

The complete social network formed in the course was complex, not only for its structure, but also the different learning behaviors behind the network and the topic. Social network analysis is a quantitative research method, and behind each interaction there are various motivations, interaction behaviors, methods, styles, and purposes. The social network analysis should be combined with learning behavior analysis and with learning technology analysis in this type of learning. The different interaction behaviors may represent different interaction depth and intent of learners in the course. The technology used, in part, determines the interaction behavior that learners can make in their learning, thus, we need deeper analysis and understanding through combining social network analysis, learning behavior analysis, supporting technologies, and qualitative intent and perception analysis together to gain a deeper understand about learners' participation in this kind of learning.

4. This study explored typical participation patterns based on interactive topics with an example of blog-based interaction. The topic generation process, the interaction around on it, and the social network formed around this topic are each examined. More than 4000 posts were generated in the three main spaces of the course and each topic had the potential to inspire interaction amongst participants. Though there are some topics that received no replies, we argue that this does not mean they did not have interaction potential. For example, we found a Spanish participant published a post in English and nobody replied to it. However, when he published the same text in his blog in Spanish, 12 replies were made. So, with a change in audience or context, the result may be different. This is the value of connectivism. Every topic and every participant has the potential to connect with participants with different background together, the increased diversity of the topic and participants adds to the power and utility of the network.

Considering the cognitive engagement of learners, there are four levels of interaction from operation, wayfinding, sense-making, to innovation in CIE (Wang, Chen, & Anderson, 2014). Though there are more active contributors in this cMOOC than other communities and in most xMOOCs. When considering the quality of their posts, perhaps only a few of these reach the innovation level, because learners may make contribution at different levels according to their learning objectives, interests, and learning abilities. When analysing the technologies learners adopted to support their connectivist learning and the participation patterns, we found that different technologies work at different levels of interaction to support the learning. For example, Twitter was mainly used in the work at the wayfinding level and blog worked more at the sense-making and innovation levels. The deepest interaction happened in the blog space followed by the Facebook group and Twitter. It follows that we need more research to more clearly understand learners' participation with the CIE framework to gain a deep understand on learners' participation. This study also reports on a typical concept network and social network formed around a topic. In the future, we will analyse these networks forming and changing processes in each space over a limited number of weeks. It will provide us more generalized insights into learners' participation in the connectivist learning process.

In order to get a clearer picture of how learners participate in connectivist learning, this paper analyses learners' social interaction traces retrieved from different perspectives from network building and formulation. We also examined learners' participation by various technologies (technology network) by the social network of a space and around topic and topic generation process. Each of these approaches can be analysed and compared from both quantitative and qualitative perspectives (Skrypnyk et al., 2015; Bozkurt et al., 2016). This will be a future focus of our study. The limitation of this study is that we only analyse the data left in the typical spaces that are easily and publically accessed in the internet. There's no doubt that other interactions occurred in other closed groups, private communication, or were not recorded on the internet. Thus, in the future, we need to use multiple forms of public and private research to understand learner behaviours and approaches in this much less structured learning context.

Ethical Considerations

The authors state that there was no conflict of interest involved in this study. We obtained permission from one of the course facilitators- George Siemens - to use the data in the research. When participants registered into the Change 11 MOOC, they signed an agreement that permitted the use of their data for research purposes (<http://change.mooc.ca/privacy.htm>). All of data can be accessed without passwords in the internet.

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The Moderating Effects of Group Work on the Relationship Between Motivation and Cognitive Load



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Abstract

Semi-formal learning is used to describe learning that is directed towards the goals of a formal learning institution but outside of the learning structure of a specific class. Students studying online may form semi-formal groups to increase their knowledge of the content by interacting with other learners taking the same class. This study of cyber university students ($n = 2042$) involved looking at the relationship between semi-formal learning groups and levels of germane load. Furthermore, this study sought to understand what role group work plays in moderating the relationship between motivation and germane load. This study found that highly motivated students had higher levels of germane load, and that group work negatively moderated that relationship. In other words, while all students benefited from group work, students with lower levels of motivation benefited more than students with high levels of motivation. This research fills an important gap by showing the value this type of group work can have for all learners, particularly those who may otherwise struggle.

Keywords: collaborative learning, germane load, group work, intrinsic motivation, semi-formal learning

Introduction

The use of e-learning at universities to optimize resources has been seen as a potential solution in providing high quality education in the face of dropping enrollment and tightening budgets (Lee & Lee, 2015). Not only institutions, but students themselves, see benefits in taking online classes such as a wider range of courses and flexibility of learning (Parsad, Lewis, & Tice, 2008) E-learning environments provide great opportunities for potentially high quality learner-to-learner collaborative learning situations. Furthermore, lately there have been increased calls for using group work at universities, emphasizing its value in research concerned with students in tertiary settings (Herrmann, 2013). Also, outside of the pedagogical framework of the university, students are collaborating by generating informal learner-to-learner groups to better understand course content (Vaughan, Nickle, Silovs, & Zimmer, 2011). Generally speaking, formal learning contexts provide students with specific pedagogical direction and materials, On the other hand, informal learning is learning that is not planned or structured and can happen anywhere (Schugurensky, 2000). While formal group work has been studied in some depth both offline and online (Costley & Lange, 2016a; Johnson, Johnson, & Smith, 2014), informal ad-hoc collaborative groups and their effect on learning is an area that has potential for fruitful investigation.

Another term, semi-formal learning, has been used to describe learning that is directed towards the goals of a formal learning institution but outside of the learning structure of a specific class (Jones, Scanlon, & Clough, 2013). For the purposes of this paper, we will call this “semi-informal.” In this context, semi-formal learning means students are engaged in learning for the purposes of doing well in a specific class, but outside of the parameters of specific directions from the instructor, for example activities that contribute to the class, but are not part of the formal structure of the lesson (Jones et al., 2013). This type of learning occurs when students need to overcome some of the more challenging situations they may face in e-learning situations (Butson & Thomson, 2014). Groups engaged in informal learning can be viewed in some way as systems for processing information (Tindale & Sheffey, 2002). One common justification for this view, and in turn a reason for assigning work to groups, is the limitations of individual students in processing information (Davis, 1980). More specifically, individual members retain information shared in groups better than information learned separately (Tindale & Sheffey, 2002). While we have learned more about how group collaboration affects processing, group work has limitations in its ability to improve teaching and learning (Kerr, MacCoun, & Kramer, 1996). For example, certain individuals may retain more information that is shared in the group; however, others may feel overloaded by the interaction (Wittenbaum & Stasser, 1996).

Extant research has looked into methods of measuring the progress of students who work in groups, and germane cognitive load serves as reliable way to understand and measure the underlying learning processes occurring in both online and offline learning. Germane load is one of three elements that make up cognitive load theory, with the other two being intrinsic and extraneous load. Cognitive load theory relates to an individual's retention of information through processes connected to how learners transfer information from their working memory to their long term memory (Cierniak, Scheiter, & Gerjets, 2009; Kalyuga, 2011; Sweller, Van Merriënboer, & Paas, 1998). Because the working memory has a limited capacity for retaining information, instruction that creates excessive processing can create higher levels of

cognitive load (De Jong, 2010). Levels of information transfer that contribute to learning are either positively or negatively affected depending on the type of information being processed (Chandler & Sweller, 1991; Mayer & Moreno, 1998; Mayer & Moreno, 2003; Moreno, Mayer, Spires & Lester, 2001). In the case of both intrinsic load (content complexity) and extraneous load (processing of unnecessary information), higher levels are generally considered to not be useful for the learning process, unlike germane load, which directly contributes to learning through student effort to construct schema for the better understanding of information (Sweller et al., 1998). Specifically, when intrinsic load levels are excessive, extraneous load has a negative impact on germane load (van Merriënboer & Sweller, 2010). Although high levels of both intrinsic load and extraneous load are generally considered detrimental to germane load, there is a balance where a certain amount of intrinsic load may be required for learning to occur. Specifically, high element interactivity that is associated with higher levels of intrinsic load is needed to connect new information to already existing schema and eventually contribute to germane load (Van Merriënboer & Sweller, 2010). However, if the gap between what a student knows and what a student needs to learn creates excessive cognitive processing when dealing with element interactivity, then learning can be negatively affected (Van Merriënboer & Sweller, 2010).

The amount of motivation students have towards the class contents affects levels of germane load (Homer, Plass, & Blake, 2008). As with effort, intrinsic motivation is also important within e-learning (Martens, Gulikerst, & Bastiaens, 2004). Intrinsic motivation leads to complex processing by learners, as they strive to comprehend more intricate content as an end in itself, rather than for any set of external reasons (Pintrich, 1991). Students that are intrinsically motivated are more likely to form a set of goals that ultimately determine the manner in which they engage the content (Meece, Blumenfeld, & Hoyle, 1988). Furthermore, intrinsically motivated students are more likely to embrace a mastery orientation, which stems from the belief that knowledge can be shaped through higher levels of effort, and that such effort applied to challenging situations is better for learning (Crippen, Biesinger, Muis, & Orgill, 2009). One term that focuses on intrinsic reasons for learning as they are related to goal setting is intrinsic goal orientation (IGO). Intrinsic goal orientation refers to the students' internally driven motivation to achieve their general goals of the course (Pintrich, 1991). Students with high levels of intrinsic goal orientation often participate in the learning process out of a sense of challenge, curiosity, or mastery (Pintrich, 1991). The fact that students with low motivation achieve less in some situations, makes group work all the more important, as it may help those that are less motivated increase levels of germane load (Puzziferro, 2008).

Literature Review

Group Work and Germane Load

Informal group work can benefit learners by promoting critical thinking, cognitive development, and socialization (Carss, 2007). Further to this, students engaged in varied types of informal learning have shown dramatic increases in higher order cognitive skills in the literature (Collier, 1980). Within informal

group work, learning is maximized when individual learners contribute towards the common goal of the group through informal interaction (Johnson et al., 2014). Experiments have shown that participating in informal group work aids the learning process, and that the greater the interaction, the greater the learning (Tsay & Brady, 2010). Group work can be more effective than lecturing in some contexts because students work harder and understand concepts in greater detail (Carlsmith & Cooper, 2002). These types of learning gains also translate into online group work, as learners who collaborate in online learning communities have shown higher levels of cognition (Akyol & Garrison, 2008). Such interaction promotes the processes that are involved in the construction of authentic and complex learning (Andriessen, Baker, & Suthers, 2003), facilitates reflective interaction (Baker & Lund, 1997) and meaningful communication when dealing with questions (Jonassen & Kwon, 2001). For example, the *self-explanation principle* states that when learners are required to explain something to themselves it will optimize their levels of germane load from learning that content (Van Merriënboer & Sweller, 2010). Further to this point, when learners are required to explain a concept they tend to have a deeper knowledge and understanding of that concept (Williams & Lombrozo, 2010). Although providing instructional settings that promote this type of learning has is useful to the learning experience, it is not always practical in specific formats of e-learning due to the mass enrollment in university e-learning courses (Yuan & Powell, 2013). Forming semi-formal learning groups may serve as a substitute for the lack of interaction within massive online courses. Learners who have participated in semi-formal group work have benefited from exploring, engaging in inquiry, and having novel learning experiences (Rogers & Price, 2008).

While informal group work in some circumstances is beneficial, there are some potential pitfalls or risks. If a learner is part of a group, but does not participate equally with other members, they may not have the opportunity to construct their own knowledge and therefore, learn (Lange, Costley, & Han, 2016). One example of the problems of unequal participation is “social loafing,” where students involved in group work do not contribute, and force the rest of the group to do the majority of the work. Furthermore, when one or more group members are taking a disproportionately greater role, this can crowd out other group members from participating and potentially learning (Kagan, 1989). Interaction by all members has leads to greater understanding by everyone in the group (Zhu, 2012). Furthermore, interaction in an e-learning environment is mostly positive for learners, though the environment must be balanced and consideration must be given to the learner’s social and cognitive development (Costley & Lange, 2016a; Costley & Lange, 2016b).

Not all situations where learners interact, will lead to cognitive development (Kreijns, Kirschner, & Jochems, 2003). When more than one learner is interacting with another, there is a cognitive transaction cost caused by the process of sharing the information (Kirschner, Paas, & Kirschner, 2009). This cost is the time taken to transfer information from one group member to another, and the potential miscommunication that may occur. So while the group has increased its processing power by dividing the workload across working memories interacting together, the transaction cost may offset this balance (Kalyuga, 2011). This can be particularly the case when the task is simple, in that, for more complex tasks, the added mental-power is a net of a benefit, while for simple tasks the transactions costs outweigh the added benefit (Kirschner et al., 2009). Also, when groups work together, the benefits that may be derived

from the group work in terms of learning and production may take some time to manifest (Gruenfeld & Hollingshead, 1993). Furthermore, interaction between learners can often lead to off-task social activity, which detracts from the group's ability to process information (Kreijns et al., 2003). While there has been an abundant amount of research that has examined the effects of group work on cognitive processes that lead to learning, the majority of these studies focused on strictly online or strictly offline group work. There is a lack of empirical evidence, however, on the effects of offline group work on germane load among university students enrolled in massive online learning classes.

Intrinsic Goal Orientation and Germane Load

A meta-analysis study performed by Payne, Youngcourt, and Beaubien (2007) found that research overwhelmingly shows that students who display mastery goal orientation are more successful in terms of learning the content. High levels of IGO are predictors of valuing a deeper understanding of specific tasks and activities (Lyke & Kelaher Young, 2006). This is reflective of the long-term persistence toward learning that is associated with intrinsic goal orientation (Vansteenkiste, Lens, & Deci, 2006). The way intrinsically motivated students cognitively process information can help them to gain a better understanding of the content and ultimately increase levels of germane load. Higher levels of germane load can occur when students use available space within their working memory to set goals (Granger, 2012). This is evident in cognitive behavior modification, where setting goals is a part of the modification of one's cognitive processes (Stipek, 1996). Furthermore, the adoption of one's specific goal orientation has an effect on not only their motivation, but also on their cognition and achievement (Wolters, 2004). This is evident in that Pintrich and DeGroot (1990) showed a relationship between intrinsic goal orientation and the use of specific cognitive strategies employed to increase learning. Ultimately, intrinsic goal orientation is specifically believed to be a predictor of students' cognitive processing (Sins, van Joolingen, Savelsbergh, & van Hout-Wolters, 2008). However, showing a connection between intrinsic goal orientation and cognitive processing falls short in advancing research regarding intrinsic goal orientation and germane load. Further analysis of whether such cognitive processing further leads to more acquisition of knowledge would be useful for the promotion of intrinsic goal orientation.

Group Work, Intrinsic Goal Orientation, and Germane Load

Rienties, Tempelaar, Van den Bossche, Gijsselaers, and Segers (2009) showed that individuals who are intrinsically motivated are more likely to contribute to cognitive task-related discourse through shared information within a group work setting. Additionally, highly intrinsically motivated learners contribute more to planning within a group setting than those that are less intrinsically motivated (Rienties et al., 2009). It is a point of interest to discover whether group work can help less motivated learners learn, or conversely, whether highly motivated learners may struggle within their coexistence with others with differing goals. Addressing the latter issue, Järvelä, Volet, and Järvenoja (2010) claimed that although motivation is an important part of collaboration, it comes with some challenges within a group setting. Each member of a small group brings with them a different set of goals, cognitions, and set of motivational beliefs, which can create conflict within a group setting as members struggle to find a common ground (Järvelä et al., 2010).

When entering a group work setting, an individual's set of goals needs to give way to group goals (Wosnitza & Volet, 2009). While this may be challenging for high intrinsically goal oriented students, it can pave the way for lower motivated students to succeed within a group work setting. Reflective of this, Pee, Kankanhalli, and Kim (2010) claimed that once interdependent goals are successfully set within a group setting, knowledge sharing intrinsically follows, allowing all learners to receive support from group members. This effectively allows lower motivated students to become part of the knowledge sharing process. Intrinsically motivated learners can assure that this occurs by striving for positive interdependence, which exists when group members come to the understanding that they can succeed only if all members achieve the shared goals of the group (Johnson & Johnson, 2003). When high intrinsically motivated students realize their success as a group is based on the work of others, they are more likely to share information (Nichols & Miller, 1994). Accordingly, lower motivated students effectively become the beneficiaries of the effort put forth by the high intrinsic students. Furthermore, it may be the case that low motivated students will be more likely to adopt a set of goals to help them learn within a group setting (Johnson & Johnson, 2003). Existing research provides some insight into the processes that are occurring within group work, as students with varying levels of motivation interact with each other in ways that can impact their acquisition of knowledge. It would be of particular use for e-learning research to examine these effects within offline groups that are formed to gain a better understand of instruction within online settings.

The Current Study

This research examined students participating in classes at the Open Cyber University (OCU) in South Korea, which provides online credit classes for students who are enrolled at one of the 23 traditional brick-and-mortar universities that make up the OCU consortium. The OCU is currently the largest cyber university in South Korea with approximately 120,000 students participating in about 400 classes (Open Cyber University of Korea, n.d.). Students working together in groups as part of their class improve cognitive strategies and processes that contribute to learning (Johnson et al., 2014; Korkmaz, 2012). With this in mind, it is important to understand if the benefits of group work can be transferred to gains in cognitive load as well (Van Merriënboer, & Sweller, 2010). Specifically, this study looks at the moderating effect of informal offline group work on the relationship between intrinsic goal orientation and germane load. This study hypothesizes that the moderating effect of group work reduces the relationship between intrinsic goal orientation and germane load. With this in mind, this study explores the research question: Does group work benefit the learning of students with lower levels of motivation more than it benefits students with higher levels of motivation. Therefore, the current study examines the following hypotheses:

H1. Group work is positively correlated with germane load.

H2. Motivation is positively correlated with germane load.

H3. Motivation is positively correlated with group work.

H4. Group work moderates the relationship between intrinsic goal orientation and germane load.

Methods

Research Procedures and Data Collection

The first step in this study was a development of a survey that focused on learners' self-directed behavior such as offline group work. The initial survey was translated from English into Korean. An expert in the OCU and e-learning checked the translations and found them to be rigorous and correct representations of the English items. The items were then uploaded into a Google Sheets form and a link to the form was created. This link was sent to the OCU's administration who reviewed its acceptability for their students. Once the survey was accepted, a link was put on the main information board on the OCU, and students were invited to fill out the survey (see Appendix).

Participants

Participants of this study attended OCU classes in the Spring semester of 2016, and filled out the survey in June 2016 at the end of the Spring semester. Two thousand six hundred eighty-nine students of the 120,000 studying in the OCU submitted surveys. From the 2689 surveys submitted, 613 failed to respond to parts of the survey that were pertinent to this research. Those surveys were removed from analysis, leaving 2076 valid responses. The next step in this research was the removal of outliers. Linear regression of group work levels and intrinsic goal orientation onto germane load was used to generate Mahalanobis, Cook's, and Leverage values to look for outliers. Any participants whose results met the standard for two or more of these tests was removed from the analysis leaving 2042. There were no shared traits among the discarded participants, except for them not filling out the survey completely or being outliers in relation to this research. All following results and tables subsequent to this are generated from these 2042 valid subjects. Of the 2042, 1061 (52%) were female and 981 (48%) were male. The average age of the subjects that were a part of this study was 23.7, with a standard deviation of 3.4. The oldest subject was 63, and the youngest was 19. Other studies of the OCU have found a similar distribution of gender and age (Suh & Kim, 2013). The respondents took a wide variety of classes in the OCU. Students in the OCU have been shown to take a similar distribution of courses: liberal arts (33%), social science (17%), technology (15%), lifestyle and health (12%), management and business (8%), foreign language (7%), natural science (6%), and design (2%) (Kobayashi & Kim, 2010).

Instruments

Group Work

To generate the indicators for measuring the varying types of group work, 10 OCU students were asked to describe types of out of class small group work the students engaged in motivated by their OCU class. The list created by the authors was then discussed with the students (6) who had engaged in this type of group work, and the students agreed that the list seemed to accurately represent the differing possible or likely

types of group work. This method of item development follows the procedure set out in Costley and Lange (2017). To understand the types of group work, students were asked to respond to one single item. The item related to the variety of types of group work student engaged in and asked students:

- How did you interact with people you know offline who were taking the same class? (Please check all that apply).

Below this, the students could check boxes with the options:

- We talked generally about the class (“The class is easy, the class is stressful”); we talked about the contents of the class, we studied together, we shared notes or materials, other, I never interacted with anyone offline, we cheated on exams or quizzes.

The responses were then coded into seven separate variables as either occurring or not-occurring, and the five positive indicators (excluding “I never interacted with anyone offline” and “we cheated on exams or quizzes”) were combined by addition into a single additive index: *group work*. It is that index that is used in this research to measure the variety of group work students were engaged in. The types of activities that were covered under the *other* category included but was not limited to: *editing others work*, *checking answers*, and *reminders about dates/times/assessment*.

Germane Load

The germane load measurement used in this study was made up of four items from Leppink, Paas, Van der Vleuten, Van Gog, and Van Merriënboer’s (2013) paper titled “The development of an instrument for measuring cognitive load.” The Likert-type scale used for these items was set at a range from 1 to 7, with 1 representing “strongly disagree” and 7 representing “strongly agree”. This current research uses the four items measuring germane load: 1) The lecture really enhanced my understanding of the topic, 2) the lecture really enhanced my knowledge and understanding of the of the class subject, 3) the lecture really enhanced my understanding of the concepts associated with the class subject, and 4) the lecture really enhanced my understanding of concepts and definitions. These items contain a limited modification of Leppink et al.’s (2013) research in that the word “lecture” replaces the word “activity” to focus in on the main instructional aspect of the OCU which are the lectures. This was done in accordance to Leppink et al.’s (2013) claim that rewording text to match the context of a specific study is an acceptable modification to the items and has also justified by numerous other studies (Costley & Lange, 2017; Debye & Van De Leemput, 2014; Kozan, 2015; Leppink, Paas, Van Gog, van Der Vleuten, & Merrienboer, 2014; Morrison, Dorn, & Guzdial, 2014). Although the Leppink et al.’s (2013) cognitive load scale was originally designed to be set at a 0 to 10 Likert-type scale, the current study set it at 1 to 7 to ensure consistency with the range throughout the entire survey. This was done because the main construct used in this study is the intrinsic goal orientation construct, which is set at a 1 to 7 range. Justification for altering the range is provided by Debye and Van De Leemput (2014). Cronbach’s alpha for the germane load construct was calculated to be .918, which is high enough for research of the type being conducted.

In Leppin et al.'s (2013) research, exploratory factor analysis was used to understand how parts of cognitive load relate to each other. The fact that the loadings for intrinsic load, extraneous load, and germane load independently represented a robust factor supports the triarchic theory of cognitive load, which according to Deleuw and Mayer (2008) allows for different aspects of cognitive load to be measured separately. However, a 2014 study by Leppink, Paas, Van Gog, Der Vleuten, and Van Merriënboer (2014) indicated that germane load may be more of representation of intrinsic load, rather than invested effort that contributes to learning, which is how past research has conventionalized it. However, this point is refuted by a more recent study conducted by Debue and van de Leemput (2014), who, using Leppink et al.'s (2013) cognitive load items, performed analysis to determine what their germane load items actually represent. However, their results differed from Leppink et al. (2013) in that the germane load items were found not to be related to intrinsic load, but a true representative of germane load and how it has been conceptualized by past research. The latter study is used as justification for the germane load items used in the current study.

Intrinsic Goal Orientation

The measurements used to calculate intrinsic goal orientation came from the *Motivated Strategies for Learning Questionnaire* (MSLQ), which is used to assess college students' motivational orientations and their use of different learning strategies (Pintrich, 1991). The Likert-type scale used for these items was set at a range from 1 to 7, with 1 representing "strongly disagree" and 7 representing "strongly agree." The MSLQ contains a variety of constructs measuring students' levels of motivation and learning strategies. From the MSLQ, the following four items were adapted for use in this study to intrinsic goal orientation: 1) In a class like this, I prefer course material that really challenges me so I can learn new things; 2) In a class like this, I prefer course material that arouses my curiosity, even if it is difficult to learn; 3) The most satisfying thing for me in this course is trying to understand the content as thoroughly as possible; and 4) When I have the opportunity in this class, I choose course assignments that I can learn from even if they don't guarantee a good grade. The Cronbach's alpha was much higher at .833, which is acceptable for this type of research.

Results

Out of 2042 students who were involved in this research 987 (48%) had no offline contact with other OCU students regarding the classes, while 1055 (52%) did have some type of offline interaction. To understand the main hypotheses of this research, Pearson's bivariate correlations were calculated. As can be seen in Table 1, there was a statistically significant positive relationship between offline interaction and germane load of .444. This shows that as offline interaction increases, so does the student's levels of germane load. Furthermore, intrinsic goal orientation was statistically significantly correlated positively with germane load (.401). This shows that students with higher levels of intrinsic goal orientation will have higher levels of germane load. Also, intrinsic goal orientation was statistically significantly positively correlated with group work (.147), meaning that students with higher levels of intrinsic goal orientation were more likely to interact with other students offline.

Table 1

Descriptive Statistics and Correlations Between the Main Variables (n = 2042)

	Mean	Range	1	2	3
Group work	N/A	0 - 5	1		
Intrinsic goal orientation	3.94	1-7	.147**	1	
Germane load	4.38	1-7	.444**	.401**	1

* $p = < 0.05$

To gain a deeper understanding of the relationship between offline student to student interaction and germane load, the individual indicators that make up the offline interaction index were calculated and can be seen in Table 2. This table shows the total amount of types of group work survey participants were involved in as either “occurring” meaning the participant engaged in that activity, or “not occurring” meaning the participant did not engage in that activity. Of the individual indicators the most common was to *talk generally about the class* (496), then *talk about the contents* (419), third *sharing notes* (310), then *other* (392), and finally *studying together* (298). All indicators had a statistically significant positive relationship with germane load. The indicator with the strongest relationship with germane load was *studying together* (.397), second *sharing notes* (.291), then *talking about contents* (.275), fourth *other* (.266), and lastly *talking generally about the class* (.204).

Table 2

The Occurrence of the Indicators and Their Correlations With Germane Load (n = 2042)

	Not occurring	Occurring	Correlation with germane load
Talk generally	1546	496	.204**
Talk about contents	1623	419	.275**
Shared notes	1650	392	.291**

Other	1741	301	.266**
Study together	1744	298	.397**

** $p = < 0.01$

Using linear regression both group work and intrinsic goal orientation's relationship with on germane load was measured (Table 3). The overall model had strong predictive power in relation to germane load ($R^2 = .32$). Also, each one unit increase in the group work scale lead to a moderate .41 ($p = <.001$) increase in germane load. Also, for every one unit increase in intrinsic goal orientation there was a moderate .35 ($p = <.001$) increase in germane load. As age had a statistically significant relationship with intrinsic goal orientation and germane load, and gender had a statistically significant relationship with intrinsic goal orientation they were added as covariates to the model. However, the addition of age and gender to the model made an insignificant impact on the model (R^2 changed from .3166 to .3174) that the results show in this study do not contain age or gender as covariates.

Table 3

Standard Multiple Linear Regression of Offline Interaction and Intrinsic Goal Orientation on Germane Load

	B	SE	β	R	R^2	F	Sig	Semi-partial
Model 1				.559	.322	462.8	.000	
Group work	.413	.019	.408				.000	.399
IGO	.346	.018	.348				.000	.342

To further establish the relationship between the main variables, ANOVA was also used. Group work variable was split into two groups, subjects who had either engaged in some type of group work, or those who had engaged in no group work. The intrinsic goal orientation was also split into two groups with those at or below the average being the “low” group, and those above the average being the “high” group. While there is a loss of information when linear variables are put into groups, or the amount of nominal groups are reduced, in this research the basic relationships between the variables are maintained, though they are not as strong as the relationships established using regression. The ANOVA results showed a total R^2 value of .15 (adjusted R^2 .15).

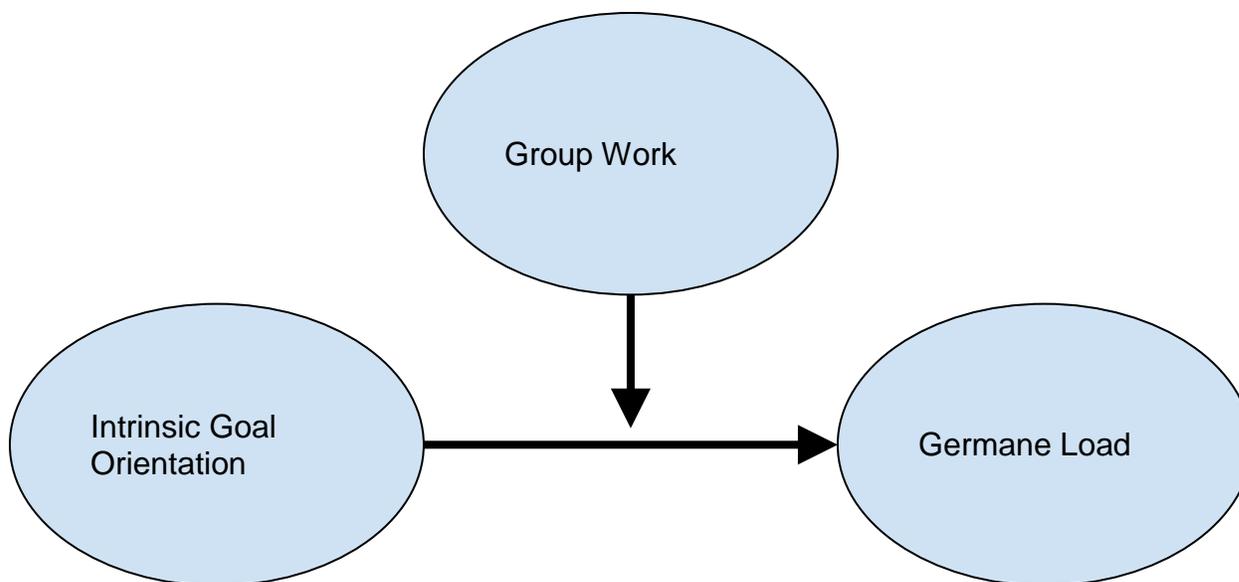


Figure 1. The moderating effects of group work on the relationship between intrinsic goal orientation and germane load.

PROCESS macro (model 1, Hayes, 2013) was used to test the interaction effect of group work levels and intrinsic goal orientation on germane load as is shown in Figure 1. To show this, 10,000 bootstrap samples with a 95% confidence interval were used. Also, variables were mean centered to +/- 1 standard deviation, to reduce multi-collinearity. The results showed strong evidence of an interaction effect based on a standardized coefficient. Group work negatively moderated the effect of intrinsic goal orientation on germane load, or in other words, as levels of group work increase, the strength of relationship between intrinsic goal orientation and germane load decreases.

Table 4

Centered Effects for Intrinsic Goal Orientation on Germane Load at Each Level of Group Work

	Group work	<i>b</i>	<i>t</i>	<i>p</i>
Low group work	-.9334	.3932	16.7971	.000
Average group work	.0000	.3478	18.8261	.000
High group work	.9334	.2878	12.2435	.000

To measure the effect of moderation, PROCESS macro was used to center the variables and measure the relative effect of intrinsic goal orientation on germane load at the-average level of group work, and at one standard deviation above and below the mean. This created a low, average, and high grouping of relationships. In all conditions, there was a statistically significant relationship between intrinsic goal

orientation and germane load. However, as can be seen in Table 4, in the low group work condition the effect size (.39) is stronger than in the average group work condition (.35) and much stronger than in the high group work condition (.28). As can be seen in Figure 2, this creates an effect, whereby the low group work condition has a steeper line than the average group work condition and the high group work condition. In this case, the lines representing the three levels get closer together as group work increases. This shows that group work weakens the relationship between intrinsic goal orientation and germane load.

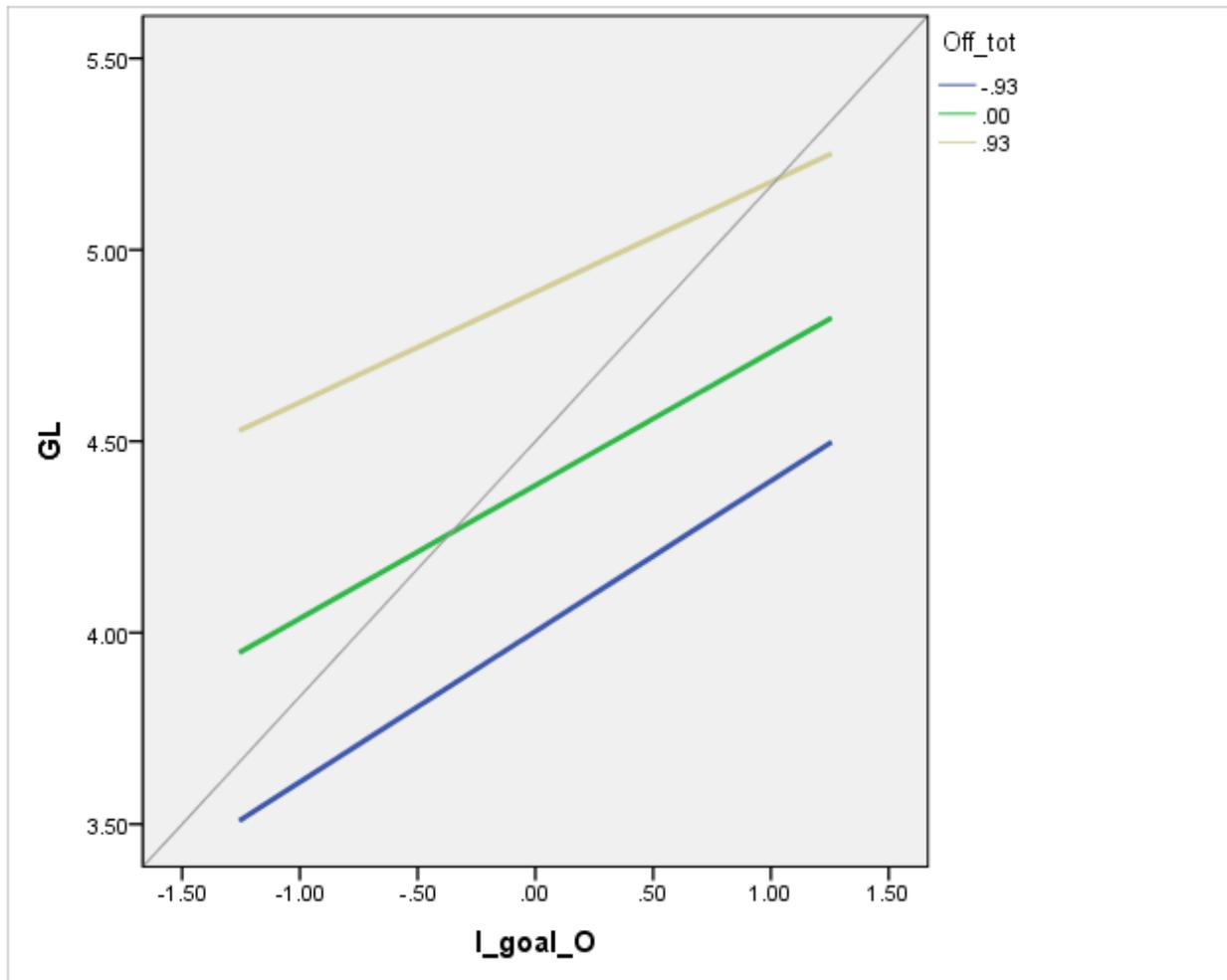


Figure 2. The relationships between intrinsic goal orientation and germane load by group work level.

Discussion

More than half of the students (52%) that were a part of this study were engaged in some level of offline informal group work. Research has shown that universities are good environments for informal group work, and that students should have the ability to be a productive part of a learning group (Herrmann, 2013; Johnson et al., 2014). The levels of informal group work that have been found in this study are

unsurprising, in view of the fact that many students find learning complex information in an online class difficult (Butson & Thomson, 2014). While group work may have some downsides and students do not always enjoy or feel like they benefit from group work (Kagan, 1989; Onwuegbuzie, Collins, & Jiao, 2009; Zhu, 2012), a little over half the students in this study decided to do group work. There is some research that suggests that group work may not lead to gains in germane load (Kreijns et al., 2003). This may be because of transaction costs, lag in the cognitive benefits of interacting within a group, or off-task behavior (Gruenfeld, & Hollingshead, 1993; Kerr et al., 1996; Kirschner et al., 2009; Kreijns et al., 2003; Wittenbaum & Stasser, 1996). The results of the present study go some way to contradicting this point of view, and suggests that offline informal group work does benefit learner's levels of germane cognitive load. Specifically, the contention that off-task social behavior may negatively affect learning is directly contradicted by this study, which showed that social interaction by learners (discussing their feelings about the classes) correlated with higher levels of germane cognitive load. This current research supports the notion that higher order cognitive skills, in the form of germane cognitive load, can be improved by semi-formal group work (Collier, 1980). A possible reason for the cognitive benefits found in the current study is that the novelty and interest generated by this type of the learning experience leads to a great deal of learning (Rogers & Price, 2008). Furthermore, the cognitive gains found from group work in this study may also be attributed to the variety of processes often inherent in group work. For example, tasks can become more engaging and complex (Andriessen et al., 2003), the interaction can promote reflection (Baker & Lund, 1997), and more meaningful engagement with the contents of the class (Jonassen & Kwon, 2001).

Some research claims that engaging, helping, and being helped by others increases motivation (Järvelä et al., 2010; Johnson & Johnson, 2003). Or, conversely, some have claimed that students who are intrinsically goal oriented may be more likely to contribute to task-related discourse and planning when engaging in group work (Rienties et al., 2009). This provides some lack of clarity in how the relationship between the OCU students' levels of intrinsic goal orientation and group work co-occur. This study showed that there was a statistically significant correlation between intrinsic goal orientation and germane cognitive load (.401). As with the current study, some research has shown that students with high levels of motivation and effort are likely to learn more, and students with low levels of motivation and effort are likely to learn less (Homer et al., 2008; Martens et al. 2004). In the case of this research, students with low motivation may have felt less engaged with the contents and therefore less likely to get cognitive gains from the class contents. Students who were a part of this study who had high levels of intrinsic goal orientation likely valued deeper understanding of the topics, and tried to master the contents regardless of extrinsic motivating factors (Lyke & Kelaher Young, 2006; Vansteenkiste et al., 2006).

This research looked at how group work and intrinsic goal orientation interact to affect germane cognitive load. It was shown that as group work increased, the relationship between IGO and germane load decreased. Although IGO was generally found to have a positive relationship with germane load, the relationship was shown to be weaker in the high group work condition, showing that there is less of a benefit to having high levels of IGO than it is to have low levels of IGO when group work is involved. This

is not to say that high intrinsic motivation is detrimental to group work, but rather that low intrinsically motivated students stand to benefit more from group work than high intrinsically motivated students. Additionally, there may be more issues that high intrinsically motivated students encounter when collaborating with other students who have their own set of intrinsic goals. Reflective of this notion, Järvelä et al. (2010) have stated that because highly motivated students enter group work with stronger pre-formed beliefs, cognitions, and goals, a greater chance of conflict may present more of a challenge for high intrinsically motivated students than it would have for low intrinsically motivated students. Because less intrinsically goal oriented students are less likely to enter group work with pre-formed ideas that may clash with those of other group members, they may be able to better focus their cognitive processing to acquire knowledge, rather than trying to resolve conflict. Although high intrinsic goal oriented students coalescing together may struggle to find mutual agreement on the setting of goals and ways in which to accomplish those goals, they are still more likely to be at the forefront of the knowledge sharing process, effectively allowing all learners, including low motivated students, to process shared information (Nichols & Miller, 1994; Pee et al., 2010; Rienties et al., 2009), which may help lower motivated students more effectively process information. Furthermore, the low motivated students may be more likely to form a set of goals within a group work setting than if they work alone (Johnson & Johnson, 2003), allowing them to better take advantage of the group work setting.

Conclusion and Limitations

When specific interactive elements are not included within e-learning environments due to the impracticality resulting from massive enrollment, it is beneficial for students to participate in semi-formal group work that can help them process shared information in a way that is helpful to learning. The results of this study highlight the importance of such group work for those students who are less intrinsically motivated, as they tend to benefit more from collaborating with other students who are taking the same class. Based on the results of this study, in settings where online interaction may be limited, semi-formal group work should be encouraged as a means of enhancing the learning experience, specifically to those who may be less intrinsically motivated. Encouraging such group work may allow low intrinsically motivated students to enhance their cognitive processing in a way that ultimately contributes to their understanding of the e-learning content. The practical significance of the current study is that unlike previous research, semiformal learning among online learners is promoted as a means to promote learning among low motivated students who are the main beneficiaries of the knowledge sharing process. There are, however, limitations to this study. Unfortunately, the complexity of the tasks undertaken by the OCU students is unknown. Therefore, it is unknown whether the complexity of the tasks played a role in how much or how little the students benefited from group work. Examining this would provide more insight into the results of the current study. Additionally, taking a qualitative approach to this study may provide clearer picture into how students specifically processed information within the semi-formal groups, and whether such strategies ultimately contributed to the learning process.

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Appendix

OCU Survey June 2016

1. Age
2. Gender
3. In a class like this, I prefer course material that really challenges me so I can learn new things.
4. In a class like this, I prefer course material that arouses my curiosity, even if it is difficult to learn.
5. The most satisfying thing for me in this course is trying to understand the content as thoroughly as possible.
6. When I have the opportunity in this class, I choose course assignments that I can learn from even if they don't guarantee a good grade.
7. The lecture really enhanced my understanding of the topic.
8. The lecture really enhanced my knowledge and understanding of the of the class subject.
9. The lectured really enhanced my understanding of the concepts associated with the class subject.
10. The lecture really enhanced my understanding of concepts and definitions.
11. How did you interact with people you know at your university who were taking the same class?
 - We talked generally about the class ("The class is easy, the class is stressful")
 - We talked about the contents of the class
 - We had regular study groups

The Moderating Effects of Group Work on the Relationship Between Motivation and Cognitive Load
Costley and Lange

- We shared notes or materials
- I never interacted with anyone from my university
- Other (please fill out)



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An Analysis of Learners' Intentions Toward Virtual Reality Learning Based on Constructivist and Technology Acceptance Approaches

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Abstract

Within a constructivist paradigm, the virtual reality technology focuses on the learner's actively interactive learning processes and attempts to reduce the gap between the learner's knowledge and a real-life experience. Recently, virtual reality technologies have been developed for a wide range of applications in education, but further research is needed to establish appropriate and effective learning techniques and practices to motivate meaningful learning. Results showed that perceived self-efficacy and perceived interaction are two crucial factors affecting perceived ease of use, perceived usefulness and learning motivation. Furthermore, learning motivation is also a predictor to affect perceived usefulness. After that, perceived ease of use, perceived usefulness, and learning motivation are three important factors affecting learner intention to use the virtual reality learning environment.

Keywords: virtual reality (VR), constructivism, technology acceptance model (TAM), perceived self-efficacy, learning motivation, perceived interaction

Introduction

The past few decades have seen accelerated use of information technology to support learning, with new learning opportunities arising through the integration of digital media in the classroom. The Internet in particular has had a great impact in the field of education, with virtual learning environments emerging as powerful tools for teaching and learning, especially for the development of online learning communities to facilitate distance learning (Liu, Chen, Sun, Wible, & Kuo, 2010). Both educators and researchers have contributed to an improved understanding of how to best integrate

real life activities into online learning. In recent years, significant improvements have been made to virtual reality (VR) technologies, allowing learners to interact with virtual worlds. Such technologies support many educational activities that integrate traditional classroom teaching and online learning (Carmigniani et al., 2001; Dunleavy, Dede, & Mitchell, 2009; Shim et al., 2003).

This continuing technological shift is highly likely to result in the development of more powerful, intuitive, interactive, and efficient communication modes, along with increased integration of rich media and the delivery of high quality learning content generated and managed by instructors. Indeed, virtual reality supports real-time simulations in which 3D computer graphics are applied to mimic the real world (Burdea & Coiffet, 2003). Advanced VR technologies feature multi-sensory interfaces which allow the learner to explore and interact with immersive environments. A virtual reality system is a computer application capable of generating a 3D environment in which the learner is an active participant, interacting with the virtual learning world through a range of multisensory interfaces. Virtual reality allows instructors to immerse learners within authentic contexts, thus providing a safe, convenient and low-cost environment in which to practice and develop new skills and knowledge (Lave & Wenger, 1991).

Based on a constructivist approach, instructional theories focus on real-life activities as a means of motivating learners. Context is an important factor which affects learning performance and also enhances learning interest and efficiency. Learners actively interact with the real world, applying their knowledge to daily life activities, thus increasing the effectiveness of learning outcomes (Chen, 2011; Chen & Tsai, 2012). Knowledge should be acquired in situated learning contexts which reflect that actual conditions under which learners are expected to apply their new knowledge and skills (Collins, 1988; McLellan, 1994). Reeves (1993) suggested that well-designed simulated multimedia environments allow for the development of apprenticeship-type tasks to support real life activities. Many researchers and educators have accepted that Web-based systems could offer an alternative to real-life learning environments (Herrington & Oliver, 2000). Advanced virtual reality learning environments could be designed to bridge the gap between the theoretical learning in formal instruction provided in traditional classrooms and the real-life application of knowledge in virtual reality environments. Along with the Internet and other innovative technological tools for communication, visualization, and simulation, virtual reality provides important technological support for creating constructivist learning environments to provide learners with a more authentic learning experience (Chang, Lee, Wang, & Chen, 2010; Lombardi, 2007).

How to best assess learner attitudes toward virtual reality learning environments is a critical issue that requires a theory-based approach. Davis's (1989) technology acceptance model (TAM) aims to explain user acceptance toward information technology. In the TAM, learner behavioral intention to use a system reflects system acceptance (Lee & Lehto, 2013). Based on constructivist and technology acceptance approaches, the present study seeks to build virtual-real worlds capable of employing

constructivist learning approaches for use in educational applications. To evaluate learner perceptions of novel learning technologies, the present study examines learners' behavioral intention to use such a virtual reality learning environment. The following section summarizes the theoretical background. Research model and hypotheses section proposes the research model and hypotheses for this study. After that, covers the proposed system design, along with experimental methodology and measures. Furthermore, model testing results and discussion will be presented. Finally, the research will discuss conclusion and propose future research directions.

Theoretical Background

Constructivist and technology acceptance approaches are used to explore learner behavioral intention toward virtual reality learning environments. TAM has emerged as a particularly promising method for assessing user attitudes and intention towards using computer technology (Vankatesh & Davis 1996). Many researchers (Islam, 2013; Weibel, Stricker, & Wissmath, 2012) have found that user perception of ease of use, usefulness, enjoyment, playfulness, system quality, information quality, and service quality affect learner attitudes towards a given technology. Liaw and Huang (2014) found that learner self-efficacy had a significantly positive impact on learner attitudes towards technologies including e-learning systems.

Constructivist Approach Toward VR

Within a constructivist paradigm, learners take an active role in their learning, since they not only absorb information, but also connect it with previously assimilated knowledge to construct new knowledge (Huang, Rauch, & Liaw, 2010). A growing body of research suggests that constructivist principles are fundamental to our understanding of learning in virtual reality learning (Cheng & Wang, 2011; Huang et. al., 2010; Sánchez, Barreiro, & Maojo, 2000). Dewey (1916) suggested that the main function of education was to enhance the learner's reasoning processes. A learner who is not motivated will not really perceive a problem, so problems selected for study should be derived from learner interests (Dewey, 1916). The constructivist approach emphasizes the development of a learner's abilities to solve real-life problems. Integrating problem solving and free discovery triggers the learner's motivation and perceived self-efficacy to improve learner abilities in solving real-life problems.

Vygotsky (1980) proposed that learning is a socially mediated activity. His theory of social constructivism emphasized the critical importance of interaction with other learners and teachers, and he suggested problem solving could be categorized as three types. First, some learning activities can be performed independently by the learner himself/herself. Second, some learning cannot be achieved even with help from others. And third, between these two extremes are tasks that learners

can perform with the help from others such as teachers or fellow learners. Previous studies have established perceived self-efficacy, interaction, and motivation as crucial factors to establish a constructivist learning environment (Chu & Chu, 2010; Liaw & Huang, 2013; Wu, Lee, Chang, & Liang, 2013). Therefore, perceived interaction is a key factor to enhance learners' ability to solve problems. Many educators employ a variant of problem-based learning to encourage learners to solve problems by outlining them, since much of the knowledge taught in schools may not be retrievable in real life (Herrington & Oliver, 2000). Virtual reality technologies can build synthetic real worlds capable of simulating, representing, or recreating the different faces and sides of reality (Carmigniani et al., 2011; Sánchez, Barreiro, & Maojo, 2000).

Perceived self-efficacy. Self-efficacy refers to a learner's belief that he or she is capable of performing a task and reaching a goal (Bandura, 1977). Bandura (1986) defined self-efficacy as a "generative capability in which cognitive, social, and behavioral subskills must be organized into integrated courses of action to serve innumerable purposes" (p. 391). For Liaw and Huang (2013), self-efficacy is a positive characteristic of effective learning. Thus, a high degree of perceived self-efficacy leads to improved learning performance and better behavioral retention in e-learning environments (Chu & Chu, 2010; Liaw & Huang, 2013). As a result, learners' self-efficacy influences their learning attitudes, skill acquisition, choice of activities, and continuing motivation to learn.

Perceived interaction. Virtual reality is typically a 3D graphic system combined with different interface devices to immerse the viewer in an interactive virtual environment (Pan, Cheok, Yang, Zhu, & Shi, 2006). For Sánchez, Barreiro, and Maojo (2000), learner-environment interaction consists of learners making use of a range of mechanisms for creating and modifying virtual worlds. Learners interact with VR environments through special interfaces designed to input a learner's commands into the computer and provide the learner with feedback from the simulation. The mode of interaction is designed to be as intuitive as possible through a variety of sensory channels. On the other hand, the learner can interact with the learning content by using scale functions, allowing the learner to alter the scale of the virtual environment and change the size of the virtual world's 3D objects (Bricken, 1991; Byrne, 1996; Sánchez, Barreiro, & Maojo, 2000; Zeltzer, 1992; Winn, 1997). At the same time, learners interact with the environment and learning objects in real-time. Information can be presented through simulated real-life settings and relevant situations, to create authentic learning experiences. Authentic content situated in the learner's daily experience is an important factor in triggering reflective thinking. Virtual reality learning environments allow learners to interact with the simulated environment, and thus learn and solve problems through an immersive and interactive experience (Wollensak, 2002).

Learning motivation. To investigate learning motivation to use virtual reality learning systems, we apply Keller's (1987) ARCS model to analyze learner behavior. The ARCS model is designed to assess how motivational aspects of learning environments (i.e., Attention, Relevance,

Confidence, and Satisfaction) stimulate and sustain learner motivation to learn (Keller, 1987). Keller suggested that attention can be secured in two ways: (1) Perceptual arousal uses surprise or uncertainty to increase interest through the presentation of novel, surprising, incongruous, and uncertain events; (2) Inquiry arousal captures interest and stimulates engagement in questioning or problem solving. Relevance establishes that a learning process is relevant to the learner's needs and goals and will thus increase learner motivation. This concept emphasizes that learning should be tied to learners' personal experiences and be important to their further learning. Confidence holds that learners should achieve competence and success as a result of their abilities. To achieve their learning objectives, teachers should prepare appropriate performance requirements and evaluative criteria. Satisfaction refers to the encouragement and support of learners' intrinsic enjoyment of the learning experience, as well as extrinsic rewards for success.

Technology Acceptance Model (TAM)

According to TAM, system acceptance is represented by intention to use, which is determined by the learner's attitude toward using the system and perceived usefulness. Perceived usefulness (PU) and perceived ease of use (PEOU) determine an individual's attitude toward using a system. PU is the extent to which a user believes that using an information system will improve his or her learning performance (Davis, 1989). PEOU is a measure of a user perception regarding a system's ease of implementation. Furthermore, TAM indicates that PEOU is a predictor of PU (Davis, 1989). An individual's attitude is seen as influencing his or her behavior when using an information system, and will eventually affect his or her actual performance. PU is a major determinant of behavioral intention to use an information system (Davis, 1989). In addition, PU and PEOU can be affected by various external variables. These external variables could be learner characteristics, system features, and the setting in which the system is used (Wojciechowski & Cellary, 2013). TAM has been used successfully by many researchers to predict behavioral intent towards the use of various information systems, as shown in Figure 1.

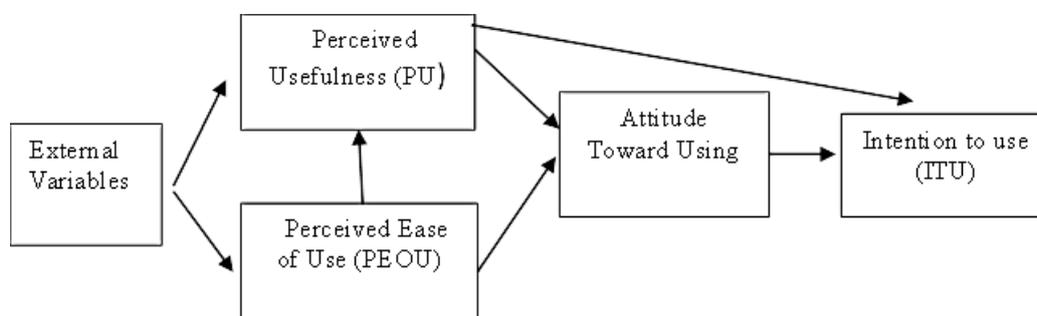


Figure 1. Technology acceptance model.

Research Model and Hypotheses

The technology of virtual reality has been broadly accepted by researchers and educators as being useful for creating an alternative to real life settings which can be used without sacrificing contextual authenticity, which is such a critical element of TAM (Herrington & Oliver, 2000). As a result, when learners interact with a virtual reality learning environment, they treat their surroundings as authentic in situated learning approaches (Chittaro & Ranon, 2007). However, it is important to evaluate actual learner motivation and intention to use a virtual reality learning environment before investing time and effort in the new technology. Based on the TAM model, perceived self-efficacy, perceived interaction, and learning motivation, we propose the following the research model (Figure 2).

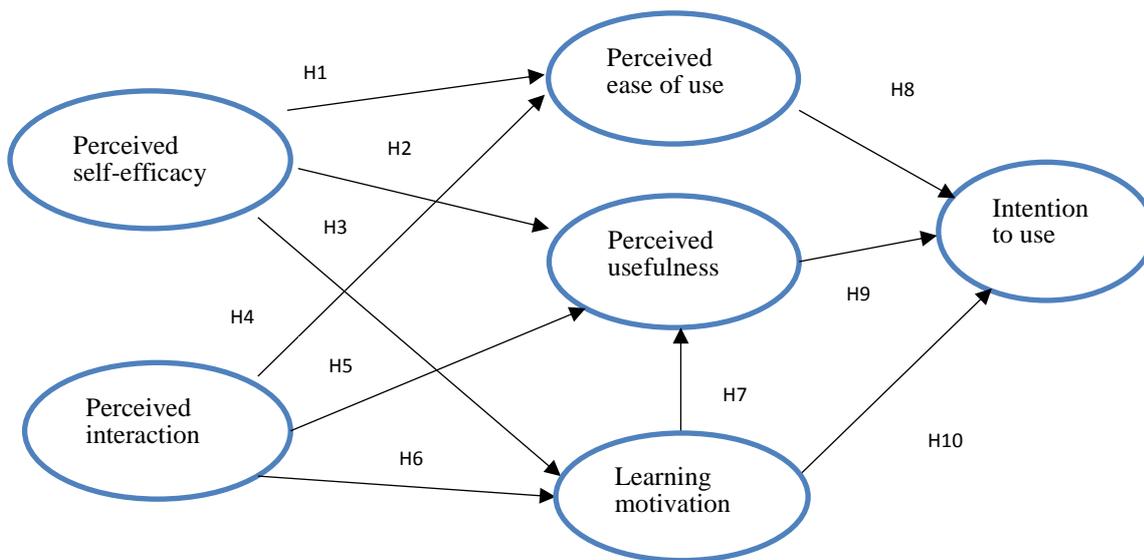


Figure 2. Research model.

Learners who perceive themselves as highly self-efficacious are able to overcome difficulties or challenges (Bandura, 1977) and will persist in their efforts longer and more actively. Learners who feel competent and experienced will gradually increase their learning motivation (Ryan & Deci, 2000; Yoo, Han, & Huang, 2012). This concept also supported by Huang and Liaw's (2007) findings that learners who believe themselves to be competent are more likely to be motivated. Perceived self-efficacy is correlated with performance, learning motivation, and learning activities (Bandura, 1986). In particular, both self-efficacy and motivation theory support that learners who have confidence in their skills and the usefulness of a particular task will perform better in technology-mediated environments (Huang & Liaw, 2007). We thus propose the following hypotheses:

H1. Learner perceived self-efficacy will have a positive impact on perceived ease of use toward virtual reality learning systems.

H2. Learners perceived self-efficacy will have a positive impact on perceived usefulness toward virtual reality learning systems.

H3. Learners perceived self-efficacy will have a positive impact on learning motivation toward virtual reality learning systems.

While a well-designed user interface can help learners use a learning system more easily, online instructions should be arranged with clearly comprehensible explanatory figures and text (Liu et al., 2010). The efficiency of immersive authoring tools depends on the degree of perceived interaction and perceived ease of use, since the learning system will neither be effective nor popular if it is difficult to use (Lee & Kim, 2009; Huang, Liaw, & Lai, 2016). Virtual reality technology provides a powerful feature to allow learners to interact with 3D objects in real-time (Thomassen & Rive, 2010), and such objects can be designed to be rotated and translated by the user (Shen, Ong, & Nee, 2010). The process of engaging with virtual reality technology also helps improve spatial cognition, making it useful for spatial instructions (Merchant et al., 2012). Moreover, Merchant et al.'s (2012) research results showed that 3D VR features support the development of learners' spatial awareness only when the learners perceive the learning experience as useful and the system as easy to use.

Learners find virtual reality learning environments to be intrinsically interesting and intuitive, which contributes to their developing a positive attitude toward the use of virtual reality learning environments (Shim et al., 2003). Thus, learners interact with either real or simulated worlds to assist their learning. Many researchers are likely to employ 3D virtual worlds to represent their perceptions into useful insights (Sherman & Craig, 2003). Immersive and interactive learning environments are more conducive than 2D animated environments to increased learner engagement and motivation (Limniou, Roberts, & Papadopoulos, 2008). Virtual reality has the potential to increase learner engagement and motivation to explore interactions between instructional content and virtual objects. Hsiao and Rashvand (2011) proposed three important factors to motivate learners by using intuitive interaction, a sense of physical imagination, and a feeling of immersion. Consequently, interactivity and environmental factors can improve learning motivation (Ryan & Deci, 2000). Based on these discussions and with reference to the conceptual model, the following hypotheses are derived:

H4. Perceived interaction will have a positive impact on perceived ease of use toward virtual reality learning systems.

H5. Perceived interaction will have a positive impact on perceived usefulness toward virtual reality learning systems.

H6. Perceived interaction will have a positive impact on learning motivation toward virtual reality learning systems.

Virtual reality learning environments could be used as a useful tool to enhance, motivate, and stimulate learner acquisition of knowledge (Shim et al., 2003). For instance, medical students perceive Web-based anatomy instruction as enjoyable and interesting (Nicholson, Chalk, Funnell, &

Daniel, 2006). Virtual reality learning environments offer learner enhanced access to learning content and thus increase learner motivation and interest in learning (Wu et al., 2013). Thus, the following hypothesis is proposed:

H7. Learning motivation will have a positive impact on perceived usefulness toward virtual reality learning systems.

An e-learning system can offer added value for learners in two ways (Johnson, Hornik, & Salas, 2008; Islam, 2013). First of all, the e-learning system provides useful functions to manage and control the learning process. Secondly, the e-learning system can offer many useful features such as collaborative learning. Therefore, learners who perceive e-learning systems as providing many types of learning assistance will perceive the system as useful to their learning (Islam, 2013). This perception of learning utility, in turn, increases their willingness to adopt and continue to use the system (Lok et al., 2006). As a result, perceived usefulness and perceived ease of use have a significant impact on an individual's intention to use a new technology or system (Huang & Liaw, 2007; Liaw, Huang, & Chen, 2007; Weibel, Stricker & Wissmath, 2012). We thus propose the following hypotheses:

H8. Perceived ease of use will have a positive impact on a learner's behavioral intention to use virtual reality learning systems.

H9. Perceived usefulness will have a positive impact on a learner's behavioral intention to use virtual reality learning systems.

Intrinsic learning motivation is an important factor which affects learner behavior (Deci & Ryan, 1985; Yoo, Han, & Huang, 2012). When learners enjoy the learning process through the use of a particular technology, learners will have a strong desire to continue to use that technology (Sørebø, Halvari, Gulli, & Kristiansen, 2009). Furthermore, learning motivation is to be found to have a positive impact on learner satisfaction and intention to continue their e-learning usage (Sørebø et al., 2009; Yoo, Han, & Huang, 2012).

H10. Learning motivation will have a positive impact on a learner's behavioral intention to use virtual reality systems.

System Overview

The system was designed in three parts: website, web server, and virtual reality. The system offers an E-commerce virtual reality learning system (ECVRLS) built using Virtools 4.0. The system's 3D graphic modules were drawn and rendered using 3DsMax. Apache and PHP were used for the web server, with MySQL used to access text data. The architecture of the ECVRLS system is shown in Figure 3. For the E-commerce learning system, there are six learning topics: logistics, cash flow, online marketing, e-commerce types, information security, and mobile commerce. Learners can

browse the learning environment's 3D scenes through their web browser. Figure 4 shows an example of a 3D shopping mall learning scenario. The learner's can direct the movement of his/her avatar in the scene, navigating the virtual situated scenario (the shopping mall) to acquire (shopping/commerce-related) knowledge. Each learning topic is situated in a narrative, and the teacher's avatar explains the learning contents and introduces learning subjects (e.g., information security). The learner can click the mouse to access individual learning subjects.

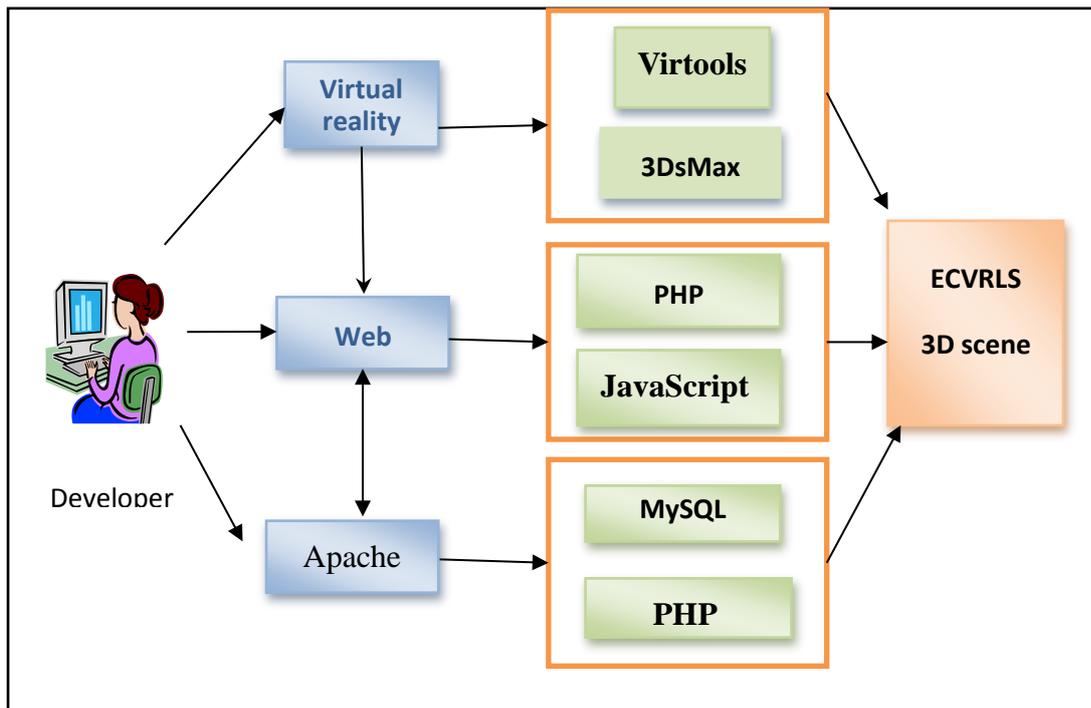


Figure 3. ECVRLS system architecture.



Figure 4. A virtual 3D shopping mall learning scenario.

Methodology

Participants and Measurement

This study surveyed learners' attitudes toward the use of virtual reality learning environments. VR installations for E-commerce courses were set up in a university of Science and Technology of central Taiwan. Each VR installation was composed of a desktop PC with a monitor and the proposed E-commerce virtual reality learning system (ECVRLS). All participants were undergraduates majoring in the Department of Information Management. A total of 308 students (170 females and 138 males) completed the study successfully and completed a confidential questionnaire. According to the results, 54.7% of participants have over 10 years of experience using computers, while 47.7% had previously used virtual reality systems, but only 27.2% had used virtual reality environments for educational purposes.

Data were collected by using a paper-and-pencil survey. The questionnaire was initially drafted by referencing survey questions used in previous studies related to VR and TAM (e.g., Davis, 1989; Huang, Liaw, & Lai, 2016; Liaw, Huang, & Chen, 2007). Table 1 summarizes the research constructs, definitions, and references. Three experts in the field were invited to review the questionnaire and to ensure the content validity, with unclear constructs either revised or removed. Results of a pre-test of 28 students resulted in four questions as discarded, leaving 20 questionnaire items formatted using a 5-point Likert scale ranging from 1 ("strongly disagree") to 5 ("strongly agree"). Six constructs were measured in the current study: Perceived self-efficacy (PSE – 3 items; Liaw & Huang, 2013; Ryan & Deci, 2000; Liaw & Huang 2007), perceived interaction (PI – 3 items; Burdea & Coiffet, 2003; Chen & Tsai, 2012; Huang, Rauch, & Liaw, 2010), perceived ease of use (PEOU – 3 items; Davis, 1989; Merchant et al., 2012; Liaw & Lai, 2013; Liaw, Huang, & Chen, 2007), perceived usefulness (PU – 4 items; Davis, 1989; Huang, Liaw, & Lai, 2013; Liaw, Huang, & Chen, 2007), learning motivation (LM – 3 items; Keller 1987; Huang, Rauch, & Liaw, 2010), and intention to use (ITU – 4 items; Davis, 1989; Huang, Rauch, & Liaw, 2010; Liaw & Lai, 2013; Liaw, Huang, & Chen, 2007).

Table 1

Research Constructs, Definitions, and References

Research constructs	Definition	References
Perceived interaction	Degree to which a learner is able to interact with other learners or with the learning system.	Burdea & Coiffet, 2003; Chen & Tsai, 2012; Huang, Rauch, & Liaw, 2010
Perceived Self-efficacy	Degree to which a learner has confidence that he/she is able to operate the learning system.	Liaw & Huang, 2013; Ryan & Deci, 2000; Liaw & Huang 2007
Learning motivation	Degree to which a learner stimulates and sustains the desired learning behaviors.	Keller 1987; Huang, Rauch, & Liaw, 2010
Perceived usefulness	Degree to which a learner believes that using a learning system would be beneficial to his/her learning.	Davis, 1989; Huang, Liaw, & Lai, 2013; Liaw, Huang, & Chen, 2007
Perceived ease of use	Degree to which a learner believes that using a learning system would be effortless.	Davis, 1989; Merchant et al., 2012; Liaw & Lai, 2013; Liaw, Huang & Chen, 2007
Intention to use	Degree to which a learner intent to adopt the learning system.	Davis, 1989; Huang, Rauch, & Liaw, 2010; Liaw & Lai, 2013; Liaw, Huang, & Chen, 2007

Measurement Model

Smart PLS 2.0 was used to test the proposed model. PLS uses an estimation approach that places minimal demands on sample size and residual distributions (Chin, 1998). Two stages are used to evaluate of the model fit (Chin, 1998; Hulland, 1999). First, the construct validity and reliability of the

measures are assessed for the measurement model. After that, the structural model with hypotheses is examined.

Validity and Reliability

To verify the validity and reliability of the measures, we observed indicators' composite reliabilities, average variance extracted (AVE), factor loadings and construct intercorrelations (Chin, 1998; Thatcher & Perrewé, 2002). For reliability analysis, composite reliability was assessed. In Table 2, composite reliability (CR) values vary from 0.89 to 0.93 and thus all are above the minimum value of 0.7 (Nunnally & Bernstein, 1994), meeting the criteria for strong reliability. To insure internal consistency, the Cronbach's Alpha values (α) of all constructs are from 0.82 to 0.91, as shown in Table 2, which exceeds the threshold level of 0.7 (Fornell & Larcker, 1981). The high Cronbach's Alpha values and composite reliability demonstrated the reliability of the measurement model.

Average variance extracted (AVE) and factor loading were used to measure validity. The results showed that the factor loadings from the confirmatory factor analysis (CFA) provide evidence for convergent validity as the loading for all items is sufficiently high on the corresponding constructs (Thatcher & Perrewé, 2002). All items exceed 0.82, thus exceeding the threshold value of 0.50 suggested by Peterson (2000). The corresponding fit measures can be found in Table 2. To check for discriminant validity, we applied the Fornell and Larcker (1981) test. The procedure shows that the square root of each construct's average variance extracted (AVE) value is significantly higher than the correlations with other latent constructs to achieve discriminant validity. An AVE value should exceed 0.5 (Barclay, Thompson, & Higgins, 1995), as shown in Table 3. All constructs satisfactorily pass the test, as the square root of the AVE (on the diagonal) exceeds the corresponding correlations among the latent constructs.

Table 2

Latent Variables Statistics

Construct	Item	Loading	Mean	α	CR	AVE
Perceived Self-efficacy (PSE)	PSE1	0.8761	3.5019	0.9101	0.9369	0.7877
	PSE2	0.8773	3.4710			
	PSE3	0.8664	3.4633			
Perceived Interaction (PI)	PI1	0.8336	3.7375	0.826	0.8962	0.7423
	PI2	0.8929	3.5444			
	PI3	0.8571	3.3668			
Perceived Ease of use (PEOU)	PEOU1	0.9066	3.2703	0.8835	0.9279	0.8109
	PEOU2	0.8874	3.2162			
	PEOU3	0.9073	3.3205			
Perceived Usefulness (PU)	PU1	0.8948	3.4170	0.845	0.906	0.7627
	PU2	0.8736	3.4981			
	PU3	0.8753	3.4903			
	PU4	0.9060	3.4903			
Learning motivation (LM)	LM1	0.8276	3.7645	0.8377	0.901	0.7522
	LM2	0.9000	3.5637			
	LM3	0.8728	3.7104			
Intention to use (ITU)	ITU1	0.8913	3.0927	0.9076	0.9355	0.7841
	ITU2	0.9010	3.0888			
	ITU3	0.9195	3.1892			
	ITU4	0.8275	3.3822			

Note. α - Cronbach's Alpha.

Table 3

Discriminant Validity for the Measurement Model

Construct	PSE	PI	PEOU	PU	LM	ITU
PSE	0.8733					
PI	0.3872	0.8616				
PEOU	0.4228	0.5808	0.9005			
PU	0.4895	0.4899	0.3989	0.8875		
LM	0.3790	0.5389	0.3425	0.4585	0.8673	
ITU	0.5363	0.5760	0.5493	0.6317	0.5376	0.8855

Note. Bold values indicate the square root of the average variance extracted (AVE) of each construct.

Model Testing Results

The structural model was applied to test these hypotheses using Smart PLS 2.0. A bootstrap procedure with 2000 samples was used to obtain t-statistics values and check the significance of the loadings. Rubin (1987) proposed a formula to combine estimates across imputed dataset results and to perform inferential hypothesis testing. The results of path coefficients and corresponding level of significance are shown in Figure 5. Perceived self-efficacy ($\beta=0.233$, $p < 0.01$), perceived interaction ($\beta=0.491$, $p < 0.001$) are two strong predictors of perceived ease of use, contributing to 38.3% of variance explained ($R^2=0.383$). Perceived self-efficacy ($\beta=0.313$, $p < 0.001$), perceived interaction ($\beta=0.261$, $p < 0.001$), and learning motivation ($\beta=0.199$, $p < 0.01$) are strong predictors of perceived usefulness, contributing to 37.2% of variance explained ($R^2=0.372$).

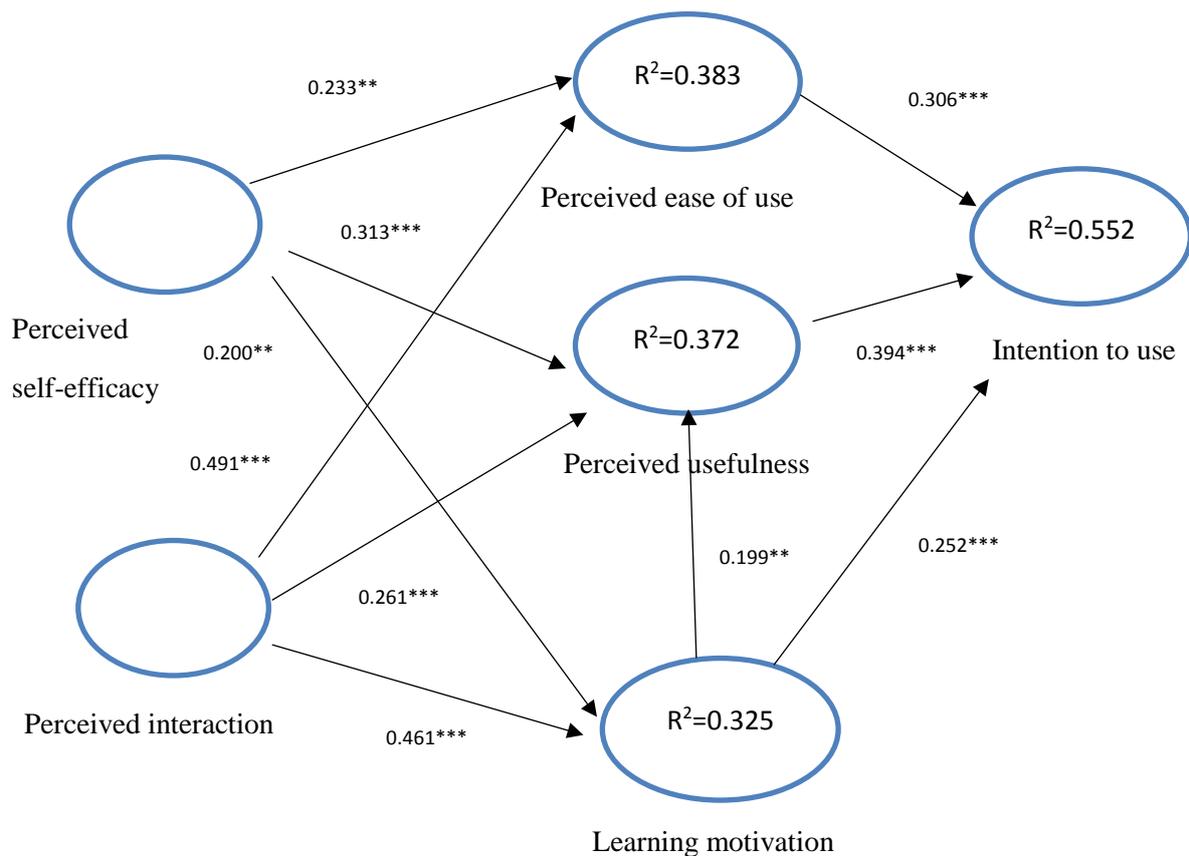


Figure 5. PLS analysis of the research model (**= $P < 0.01$; ***= $P < 0.001$).

Perceived self-efficacy ($\beta=0.200$, $p < 0.01$) and perceived interaction ($\beta=0.461$, $p < 0.001$) are two strong predictors of learning motivation, contributing 32.5% of variance explained ($R^2=0.325$). Meanwhile, perceived ease of use ($\beta=0.306$, $p < 0.001$), perceived usefulness ($\beta=0.394$, $p < 0.001$), and learning motivation ($\beta=0.252$, $p < 0.001$) are found to be strong predictors of learners' intention for system use, accounting for 55.2% of variance explained ($R^2=0.552$).

The quality of a PLS model can be determined by examining the R^2 values of the endogenous constructs (Hulland, 1999), while R^2 values indicate the predictive power to explain the proportion of variance in the criterion for the model (Barclay, Thompson, & Higgins, 1995). As Chin (1998) noted, R^2 values of approximately 0.67 are substantial, those around 0.33 are average, and those of 0.19 and lower are weak. Overall, the model explains 38.3% of variance in perceived ease of use, 37.2% of variance in perceived usefulness, 32.5% of variance in learning motivation, and 55.2% of variance in intention to use in this study. Therefore, our research model yielded substantial predictive power for perceived ease of use, perceived usefulness, learning motivation, and intention to use constructs.

Discussion

Both perceived self-efficacy and perceived interaction have significant positive impacts on learners' perceived ease of use. In particular, the path coefficient for perceived interaction is very strong and is the most important antecedent for learners' perceived ease of use. The results support that the 3D learning system could be effective and popular for learners depending on the degree of perceived interaction and perceived ease of use (Lee & Kim, 2009). Perceived self-efficacy, perceived interaction, and learning motivation would significantly affect learners' perceived usefulness. Perceived self-efficacy is the most important antecedent of perceived usefulness. Many studies have also shown that learners' perceived self-efficacy is a critical predictor of perceived usefulness for advanced learning technology (Chu & Chu, 2010; Tsai, 2009). Perceived self-efficacy and perceived interaction are two significant predictors of learning motivation. Furthermore, the path coefficient of perceived interaction is the strongest ($\beta=0.461$), making it the most important antecedent of learning motivation. The result also supports that 3D immersive and interactive learning environments increase learning motivation (Limniou et al., & Papadopoulos, 2008; Ryan & Deci, 2000). Perceived ease of use, perceived usefulness, and learning motivation then significantly affect learners' intention to use the virtual reality learning system. Perceived usefulness has consistently been seen as the most influential predictor of behavioral intention to use virtual reality systems (Islam, 2013; Sun & Cheng, 2009; Verhagen, Feldberg, Hooff, Meents, & Merikivi, 2012). As a result, perceived usefulness, perceived ease of use, and learning motivation constitute a significant influence on a learner's intention to use a virtual reality learning system.

Conclusion and Implications

While interaction with a simulated environment through virtual reality can be a reasonable and valuable substitute for real-world experience, design efforts can be minimized by basing technology usage on appropriate learning theory (e.g., constructivist learning theory). From the results of the case study, six implications are found which could possibly assist educators in designing virtual reality learning systems:

1. Perceived interaction positively affects perceived ease of use and learning motivation.

One powerful feature of virtual reality technology is that it allows users to intuitively interact with 3D objects in real-time (Thomassen & Rive, 2010), thus assisting the learning process. Virtual reality technology creates a highly intuitive and interactive user experience (Chittaro & Ranon, 2007), making the system easy to use.

Motivation is an important factor influencing learning outcomes and thus positive learning motivation can increase learning effectiveness (Sutcliffe, 2003). The immersive aspect of virtual learning environments is found to motivate learners, thus use of virtual reality systems can improve knowledge acquisition and retention (Burdea & Coiffet, 2003) beyond what is possible with 2D animated environments (Limniou et al., 2008). Therefore, educators should seek to maximize learner motivation by increasing interactivity in learning activities, especially for online learners.

2. Perceived self-efficacy can positively affect perceived ease of use, perceived usefulness, and learning motivation.

Feelings of competence and experience help learners face difficult challenges when dealing with new technologies. Learners with a high degree of perceived self-efficacy will have better learning achievements (Chu & Chu, 2010). Therefore, perceived self-efficacy is an important predictor of perceived usefulness for advanced learning technology (Chu & Chu, 2010; Tsai, 2009), and online learners with sufficient confidence in their skills using technology will feel confident in negotiating new learning processes. As a result, learners' self-efficacy influences their learning attitudes, leading them to be more persistent and active in their learning efforts, and then they gradually increase their learning motivation (Bandura, 1986; Ryan & Deci, 2000; Yoo, Han, & Huang, 2012).

3. Virtual reality learning environments can create a positive learning experience to improve learners' perceived ease of use and perceived usefulness.

The potential of virtual reality as a useful educational tool has been recognized by educators and researchers for many years (Shen et al., 2010; Guttentag, 2010). Virtual reality technology also permits learners to access a variety of useful learning resources and serves as a useful complement to class lectures (Guttentag, 2010). The integration of real-time displays facilitates changes to the visualization of the 3D objects, so the proposed virtual reality learning system provides realistic, immersive, simulated learning environments. Thus virtual reality technology can offer learners a user-friendly situated learning environment.

4. Perceived usefulness is still the most important factor for learners' intention to use virtual reality learning environments.

For Davis (1989), perceived usefulness is a major predictor for behavioral intention to use a particular information system. In addition, perceived usefulness both directly affects learners' usage of a virtual environment and indirectly improves their enjoyment of the experience (Verhagen et al., 2012). The results of the present study support the suggestion that perceived usefulness is the most significant contributor to positive learner attitudes toward using 3D

virtual reality systems (Sun & Cheng, 2009; Verhagen et al., 2012), since learners find the course content created using virtual reality to be useful.

5. Learner attitudes toward and intention to use a given technology system increase with learning motivation.

A user's willingness to accept and use a virtual reality system is also impacted by the individual's motivations to engage in a particular learning experience (Guttentag, 2010). Sun and Cheng (2009) noted that perceived playfulness could serve as a motivator to raise learner intention to engage with 3D virtual reality systems. Users will be positively disposed towards using a virtual reality system that satisfies his/her need for pleasure and fun (Verhagen et al., 2012). The results of the present study also supported many other previous findings that learning motivation is a crucial determinant of virtual reality system usage (Guttentag, 2010; Sun & Cheng, 2009).

6. The theoretical conceptual model that integrates constructivist and TAM approaches is acceptable for investigating learner attitudes toward virtual reality learning environments.

Based on the research statistical results, the theoretical conceptual model is useful for realizing learner perceptions of the usefulness of virtual reality learning environments. In such environments, perceived self-efficacy and perceived interaction are both significant factors impacting perceived ease of use, usefulness, and learning motivation. Moreover, perceived ease of use, perceived usefulness, and learning motivation are all key factors to influence learners' intention to use virtual reality learning environments. This conceptual model has practical implications for the design of virtual reality learning systems, and for enhancing learner perceived self-efficacy, interaction, ease of use, usefulness, and learning motivation. For the design of educational applications, this research provides a different perspective in that perceived self-efficacy, interaction, and learning motivation are all crucial factors to establish constructivist virtual reality learning environments (Cheng & Wang, 2011; Huang et al., 2010; Sánchez, Barreiro, & Maojo, 2000).

Future Research

Educators need to explore the potential effectiveness of virtual reality learning environments. The results of the present study validate the importance of learning motivation for learner attitudes toward using such tools. However, few empirical studies have investigated the relationship between learning motivation and learning outcomes. Educators need to be appropriately assured of the educational

effectiveness of virtual reality learning before it is widely applied in school settings. Future research could focus on investigating how virtual reality learning influences the relationship between learning motivation and learning achievement, since this study only focuses on learner perceptions of perceived usefulness. It is important to evaluate actual learning outcomes based on the use of such learning systems.

The virtual 3D shopping mall simulated in the present study is still clearly a virtual world. Chittaro and Ranon (2007) argued that virtual environment which attempt but fail to mimic will leave learners disappointed and can negatively influence their willingness to participate in learning. Future research could integrate virtual 3D information into a learner's physical environment through augmented reality (AR) technology, thus allowing learning environments to offer easy and flexible support for constructing more authentic learning activities. The integration of new advanced learning technologies would also help to improve both the realism and the usefulness of such systems.

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Content is King: An Analysis of How the Twitter Discourse Surrounding Open Education Unfolded From 2009 to 2016



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Abstract

Inspired by open educational resources, open pedagogy, and open source software, the openness movement in education has different meanings for different people. In this study, we use Twitter data to examine the discourses surrounding openness as well as the people who participate in discourse around openness. By targeting hashtags related to open education, we gathered the most extensive dataset of historical open education tweets to date ($n = 178,304$ tweets and 23,061 users) and conducted a mixed methods analysis of openness from 2009 to 2016. Findings show that the diversity of participants has varied somewhat over time and that the discourse has predominantly revolved around open resources, although there are signs that an increase in interest around pedagogy, teaching, and learning is emerging.

Keywords: open education, open pedagogy, open educational resources, social media research, temporal analysis, Twitter

Introduction

In recent years, open education has gained significant interest among educational institutions, innovation leaders, and within popular media. Provincial and state governments are supporting open education initiatives; multinational corporations are adopting open practices; and institutions are exploring open textbooks (Pitt, 2015; Bowness, 2017). Given these developments, some authors have noted that, “openness has won” (Weller, 2014, p. 3). Yet, broad familiarity with and implementation of openness in education appears elusive, as surveys show that the majority of faculty do not have a clear understanding of how open education might impact their practice (Belikov & Bodily, 2016) and current understandings of openness may rely too heavily upon content alone (Kimmons, 2016; Open Educational Quality Initiative [OPAL], 2011). By shifting the focus from content (i.e., open educational

resources or OER) to the innovative practices made available by using open content, open education may be a catalyst for innovation instead of simply a replacement of traditionally published resources (Deimann & Farrow, 2013).

This study aims to guide understanding of how the discourse around open education has evolved, which is presently missing from the scholarly literature. Limited understanding of this topic is problematic as understanding how individuals conceptualize openness can provide insight into the trajectory of the open movement, enable us to recognize how stakeholder interest may (or may not) be changing, and allow us to understand interest in, and motivations of, the open education community. In this paper, we use Twitter posts and user profiles as data sources to identify the focal points of social media discourse. A significant advantage of examining social media posts relative to other sources is that social media aggregates the perspectives of a diverse range of individuals including administrators, faculty, researchers, and so forth. Examining 16 hashtags relevant to open education, we were able to identify and retrieve 178,304 tweets, profile information from 23,061 users, and associated metadata. The retrieved data were analyzed using descriptive and qualitative analysis techniques to gain a deeper understanding of the discourse surrounding openness.

Review of Relevant Literature

Open education has long historical roots, and its development depended not solely on technological advances but also upon social, cultural, and economic developments. Peter and Deimann (2013) cite public lectures, coffee houses, open universities, and the printing press as examples of open education, which existed before the digital age, and openness in education as having been historically framed as a vision of a more inclusive, democratic, collaborative, and flexible form of education.

Open education is now most frequently associated with OER, the designation of which first emerged at a UNESCO forum in 2002. OER include openly licensed and shared educational materials that reside in the public domain or have been released under an intellectual property license that permits their use or re-purposing by others (Atkins, Seely Brown, & Hammond, 2007). The emergence of a clear and simple licensing mechanism under Creative Commons has been a key factor in the growth and proliferation of OER (Bissell, 2009). OER encompass a range of teaching and learning materials ranging from full courses and individual instructional activities, to modules, assessments textbooks, images, and software. A commonly cited and useful framework to understand OER is offered by Wiley (2007, 2014) in his 5R framework, which describes the permissions that users should have with respect OER. These include reusing, revising, remixing, redistributing, and retaining.

In this way, advocates propose that OER can “broaden access to education and knowledge, reduce costs, enhance the impact and reach of scholarship and education, and foster the development of more equitable, effective, efficient, and transparent scholarly and educational processes” (Veletsianos & Kimmons, 2012, para. 2). This emphasis purportedly helps both teachers and students by supporting greater academic freedom and teacher professionalization (Kimmons, 2016) and by fostering creative agency and the co-creation of knowledge artefacts (Hodgkinson-Williams & Paskevicius, 2012).

While early open education scholarship focused on resources (Wiley, Bliss, & McEwen, 2014), recent advocacy and research efforts have highlighted openness in other forms, such as open textbooks and open pedagogy (Ehlers & Conole, 2010; Fischer, Hilton, Robinson, & Wiley, 2015; Lane & McAndrew,

2010). Open textbooks are OER which are collected and formatted like a traditional textbook but that are also made available in digital form with an open license, which allows them to be freely shared, printed, updated, adapted, remixed, etc. Open pedagogy, on the other hand, focuses on the literacies and approaches to teaching and learning that take advantage of the unique affordances of OER - such as one's ability to make a copy of and revise instructional material - and offers new ways to conceptualize the practice of teaching and learning. Open pedagogies further engage students with open culture literacies in the context of teaching and learning, promote the production of knowledge, and often integrate both formal and informal learning environments. Some synonymous terms might be open educational practices (Ehlers & Conole, 2010) or open literacies (Kimmons, 2014). Attributes of open pedagogy often include the use of participatory technologies; sponsoring of trust; supporting innovation and creativity; greater sharing of ideas and resources; and reflective practice (Hegarty, 2015).

Given so many different perspectives or emphases of openness, it is not surprising that confusion may arise when talking about openness, that scholars may disagree in their emphases (Kimmons, 2016), or that a variety of practitioners may be doing work related to open education for very different reasons (Veletsianos & Kimmons, 2012). Though open education has a long history and has gained significant awareness and traction in recent years (Hylén, 2006), little research has been conducted on the discourses around open education or what practitioners mean when they say they are doing this sort of work. Fledgling research in understanding the discourses surrounding openness has been confined to six studies, which we will now explore in more detail.

First, Dos Santos (2008) used critical discourse analysis to explore the discourses found on two OER initiative websites. That study examined the language used to describe OER initiatives and discovered that institutional discourses were focused on content provision with an agenda to raise institutional profiles. Although OER was being situated as providing "free access to knowledge," initiatives generally failed to acknowledge the realities of underprivileged contexts that lacked basic resources necessary to make use of the provided OER such as books, writing instruments, classrooms, computers, and skilled instructors. That is, open access is not the same as democratization of knowledge (cf. Kimmons, 2015). Dos Santos (2008) argued that the perceived benefits of making knowledge resources and information available on the internet are not as causal as one might imagine and further explained that open education practitioners should critically examine how their practices are mediated by the discourses of the movement, keeping in mind the varied contexts in which OER may be accessed. While resources may be freely accessed from OER initiative websites, they inevitably come with social, cultural, and linguistic assumptions which may make them challenging to use in other contexts.

Second, Bulfin, Pangrazio, and Selwyn (2014) explored the discourse surroundings the emergence of massive open online courses (MOOCs). MOOCs historically came about as a means for enacting networked and open education, and the authors used news outlets for exploring headlines and article descriptions to understand how these courses were marketed and understood in higher education ($n = 457$). The authors found that media discourses focused primarily on the economic value of delivering education online to large groups of people, with little consideration for the pedagogical and technological affordances enabled by an open approach, thereby ignoring pedagogical or other transformative aspects of these courses in higher education.

Third, Kovanović, Joksimović, Gašević, Siemens, and Hatala (2015) conducted programmatic analysis of MOOC discourses upon news and media articles ($n = 4,024$) and found that media coverage of the MOOC phenomenon had decreased rapidly following peaks of interest in 2012-2013. The most popular topics covered by media included references to MOOC service providers; universities offering MOOCs; increased global interest in the phenomenon; and issues pertaining to assessment and accreditation. The use of programmatic analysis in this study, in contrast to traditional discourse analysis, provided an efficient way to surface emergent themes while sacrificing some of the depth associated with qualitative analysis.

Fourth, Kernohan (2015) analyzed 11 years of conference presentation titles from the annual Open Education Conference. He coded the session titles thematically and found that themes represented a multi-faceted, wide ranging, and multidisciplinary discourse. More specifically, annual themes ranged widely over time, expressing concern that the community of open education researchers could improve on building on the findings of previous research and developing more coherence and consistency as a discipline.

Fifth, Weller (2016) explored emergent subcultures within the open education research community by analyzing articles in the OER Knowledge Cloud repository ($n = 119$), an open-access research database with a focus on research relating to open education. The study found that open education research discourses have grown from a narrow set of studies focused on individual projects, to a broad field with several overlapping and complementary themes intersecting with other areas, such as open access publishing, open data, and open citizenship. Weller suggests that while there is emerging evidence of the impact open education is having on the field, there remains less empirical research than one might expect for a maturing discipline.

Finally, Baker (2014) conducted a thematic analysis of Twitter posts which included the #openeducation hashtag to gain a better understanding of the discourses occurring around open education ($n = 903$). The corpus of tweets was extracted from Twitter using a tool that restricted the researcher's control of statistical sampling, thereby limiting the generalizability of this study. The tweets were analysed and categorized into 32 categories, which spanned eight major themes including information sharing, connections, research, open educational content, open educational designs, change and awareness, open technology, and business promotion. Baker noted that the discourses emerging on Twitter were largely consistent with those being shared in the literature published on open education. These findings suggest that the Twitter discourse related to open education aligned well with scholarly discourse. Given the non-representative sample, further work in this area is necessary.

These studies demonstrate the emergent ways in which researchers are reflecting on the movement towards open education within discourse communities. By reflecting on how open education is being described through the media, literature, public websites, and social media, researchers are able to critically assess how the public may interpret the movement, track emergent themes, and explore changes to the focus and emphasis of the movement over time.

For our purposes, the Kovanović et al., (2015) and Baker (2014) studies are instrumental. The Kovanović et al., (2015) study demonstrates the value of programmatically categorizing information to glean patterns from large sources of data. Baker's (2014) study is instrumental in identifying Twitter participation as a way to make sense of the discourse in the open education community. By combining

these two aspects of past research, we are able to shed light on the discourse surrounding openness on social media.

Methods

It is widely recognized that educators, researchers, and open education advocates congregate on Twitter and post content pertaining to open education. The public nature of such comments enables researchers to take an in-depth look at that discourse and identify ways it has or has not changed over time. The use of social media data to make sense of issues facing higher education is an emerging field of study, with some researchers beginning to probe the use of large-scale Twitter analysis as a means for shedding light on matters of scholarly and academic concern (e.g., Kimmons & Veletsianos, 2016; Kimmons, Veletsianos, & Woodward, 2016; Veletsianos & Kimmons, 2016). Such studies demonstrate the diverse ways that academic practitioners use Twitter and highlight the value of analyzing large datasets for examining topics pertaining to education.

In this study, we examined the discourse around openness and its evolution over time from a large Twitter dataset roughly 200 times greater than that utilized by Baker (2014). In doing so, we generated an in-depth picture of the broader open education community over time and addressed limitations in prior studies that examined singular aspects of specific communities.

Research Objectives and Research Questions

Our intention with this paper is to contribute to a better understanding of the notion of openness using data sourced from Twitter as a vehicle to do so. We posed the following three questions to operationalize and guide our study:

RQ1. How is openness represented on Twitter, and how has participation frequency changed over time?

RQ2. Do we now see more people and a greater diversity of people participating than in the past?

RQ3. How has the Twitter discourse on openness changed over time?

By exploring each of these questions in turn, we hoped to develop a sense for what aspects of openness were being discussed on Twitter (RQ1), how diverse such conversations have been (RQ2), and how trends and norms have historically developed (RQ3).

Data Collection

By targeting open education hashtags, we were able to identify posts related to open education and their respective authors. The first step involved identifying hashtags relevant to the open education community. We identified these hashtags using a crowdsourced process. A blog post shared on social media and brought to the attention of the open education community invited individuals to contribute hashtags relevant to open education to a publicly-accessible Google spreadsheet. The hashtags contributed by users are identified and described in Table 1. The next step involved using the Twitter Application Programming Interface (API) and various manual processes described in prior research efforts (e.g., Kimmons & Veletsianos, 2016; Veletsianos & Kimmons, 2016), to collect all available tweets and user profile information from the 16 hashtags most pertinent to our research questions.

The collected dataset consisted of 178,304 tweets and 23,061 users. Metadata associated with tweets (such as the date and time that each tweet was posted) and users (such as the biographical information provided by each user) were also collected.

Table 1

Collected Tweets per Hashtag

Hashtag	Tweet count	Description
#oer	140,740	Open educational resources
#openeducation	11,436	Open education
#oep	6,938	Open educational practice
#opened15	6,478	Annual Open Education Conference, generally held in North America
#opened14	4,946	Annual Open Education Conference, generally held in North America
#opened13	3,126	Annual Open Education Conference, generally held in North America
#opened12	2,836	Annual Open Education Conference, generally held in North America
#opened11	2,086	Annual Open Education Conference, generally held in North America
#oer11	1,131	Tweets generated around the annual Open Education Resources conference generally held in the United Kingdom
#go_gn	1,098	Global OER Graduate Network
#oerglobal	919	Annual Open Education Global conference
#opened10	887	Annual Open Education Conference, generally held in North America
#oer10	676	Tweets generated around the annual Open Education Resources conference generally held in the United Kingdom
#roer4d	294	Research on Open Educational Resources for Development in Global South project
#openpedagogy	257	Open pedagogy
#openped	160	Open pedagogy
Total Tweets	178,304	Some tweets include more than one of the above hashtags

Data Analysis

We employed mixed methods analyses to answer the posed RQs, which varied for each. Descriptive statistics were reported for all RQs, and all questions required some form of qualitative analysis, which was intended (a) to generate some quantitative data (e.g., gender and location of users) and (b) to identify and illustrate various aspects of the discourse surrounding openness (e.g., categories of tweets). Additional specific analysis information is provided in the results section for each specific RQ.

Results

Our guiding research question for this study was: How has the discourse surrounding openness unfolded on Twitter? To answer this, we focused on the three secondary research questions listed above. We will now provide results for each of these secondary questions in turn.

RQ1. Openness on Twitter

To investigate this RQ, we first created three categories under which one can conceptualize openness: *education* in a general way, *content* or resources, and *practice* or pedagogy. These categories were largely identified by the way in which hashtags were described through the crowdsourced process, as contributors were asked to provide a description of how the hashtag was being used within the Twitter community.

Next, we programmatically coded the topical hashtags in the collected tweets as belonging to these three conceptual categories. For example, #openeducation and #openlearning as *education*; #opencontent, #oer, and #openresources as *content*; and #openpedagogy, #oep, and #openped as *practice*. Because multiple hashtags could be used in a single tweet, these categories were not exclusive, and overlapping use was also analyzed.

Descriptive analysis of categorized tweets revealed that *content* hashtags were much more prevalent than were *education* or *pedagogy* hashtags at 90.6% vs. 7.7% or 4.1% of the total number of categorized tweets (cf. Table 2). This revealed that most of the conversation related to openness revolved around *content* rather than *education* or *practice* at a rate of about 10 to 1. Furthermore, a noteworthy portion of *education* (19.7%) and *practice* (21.0%) tweets also used *content* hashtags, which revealed that even the tweets belonging to other categories were often connected with the conversations about content. Thus, we concluded that conversations were largely dominated by an emphasis on *content* rather than other open considerations, such as *practice* or *pedagogy*.

Table 2

Tweet Category Frequencies and Overlaps

	Total number			Percent of total			Percent of overlap (Y/X)		
	Education	Content	Practice	Education	Content	Practice	Education	Content	Practice
Education	11,739	2,314	54	7.7%	1.5%	0.0%	-	19.7%	0.5%
Content	-	138,319	1,326	-	90.6%	0.9%	1.7%	-	1.0%
Pedagogy	-	-	6,321	-	-	4.1%	0.9%	21.0%	-

One way to conceptualize how participation changed over time was by using the Open Education Conference hashtags (e.g., #opened10, #opened11) as proxies for annual participation. An examination of the trend for this conference between 2010 and 2016 revealed that more people had tweeted to the conference hashtag each year, with an annual average increase of 25.8% per year and a total increase of 205.2% across the five years following 2010 (cf. Table 3). Tweets per user had also steadily increased in this time period, with an annual average increase of 22.8% per year and a total increase of 238.8% across the five years.

Table 3

Open Education Conference Tweet Frequencies by Year

Hashtag	Tweets	% Increase	Users	% Increase	Tweets per user	% Increase
#opened10	889	-	191	-	4.7	-
#opened11	2,086	134.6%	273	42.9%	7.6	64.2%
#opened12	2,825	35.4%	368	34.8%	7.7	0.5%
#opened13	3,129	10.8%	476	29.3%	6.6	-14.4%
#opened14	4,947	58.1%	488	2.5%	10.1	54.2%
#opened15	6,479	31.0%	583	19.5%	11.1	9.6%

RQ2. Diversity of Participants

Given this uptake in participation, we also sought to understand the diversity of individuals participating on hashtags associated with openness. The factors that we considered included users' genders, locations (country), account types, and roles. To categorize these four factors, we manually examined users' biographical and metadata information included in their public profiles of a stratified random sample of users ($n = 1,014$), which allowed for generalization with a 95% confidence level at +/- 3%. Two researchers met five times to conduct this analysis. After initial discussions and collaborative coding, the first researcher coded all the data. Next, the two researchers met to review and discuss the assigned codes. The second researcher, then examined all assigned codes to check for uniform application and to eliminate any potential bias. The information used to code for gender, location, type, and role was as follows:

- Gender was derived from the user name and profile photo or through further following the account URL or conducting a name search. A total of 682 out of the 1,014 accounts were identified as either male (400) or female (282). The gender of the rest of the accounts could not be identified either because it was unclear with the available profile information or due to accounts representing institutions, organizations, etc.
- Location was inferred using the location field data that Twitter users may provide in their profiles. Where user location was unclear, further checks were conducted by following the account URL or by conducting a name search. The locations of 856 accounts (of 1,014) were identified.
- Regarding type, accounts were divided into two groups: individual (686) or organization (227). Accounts were further categorized into roles based on information provided in each account's profile description, account URL, and background search. The assigned codes, descriptions, and prevalence of account roles are shown in Table 4 for individual accounts and Table 5 for organizational accounts. To safeguard privacy, results for individual users are not included or are de-identified in this report.

Table 4

Individual Accounts Coded

Role	Description	Count	%
Educator	An individual who reports working in K-12 or higher education in an instructional or research capacity.	210	30.61%
Educational developer	An individual who reports working as an educational developer, e-learning developer, faculty developer, instructional designer, or within a teaching and learning centre.	132	19.24%
Other	An individual whose role could not be determined from available data.	123	17.93%
Corporate	An individual who reports working outside of education, non-profit, or government agencies.	112	16.33%
Librarian	An individual who reports working in a K-12 or higher education library.	41	5.98%
Non-profit	An individual who reports working in a non-profit, international, or funding agency.	35	5.10%
Student	An individual who reports being a student.	28	4.08%
Government	Individuals who report working in a government agency.	3	0.44%
Journalist	An individual who reports working as a journalist.	2	0.29%

Table 5

Organizational Accounts Coded

Role	Description	Count	%
Educational institution	An account associated with a K-12 or higher education institution.	67	29.52%
Non-profit	An account associated with a non-profit, international, or funding agency.	52	22.91%
Corporate	An account associated with an organization outside of education, non-profit, or government agencies.	50	22.03%
Other	An account in which the role could not be determined from available data.	32	14.10%
Government	An account associated with a government agency.	12	5.29%
News	An account associated with a news agency.	11	4.85%
Conference	An account associated with a conference.	3	1.32%

First, to understand location differences, we mapped location data to individual tweets and discovered that 40.4% of the identifiable users were from the United States and that these users had created 48.4% of the tweets (cf. Figure 1 and Table 6). The next highest countries in this ranking were the United Kingdom (9.6%) and Germany (9.2%). This result indicated that the U.S. represented an extremely strong plurality in conversations surrounding openness, that all other countries combined only constituted a very slight majority, and that the Western world represented a strong majority.

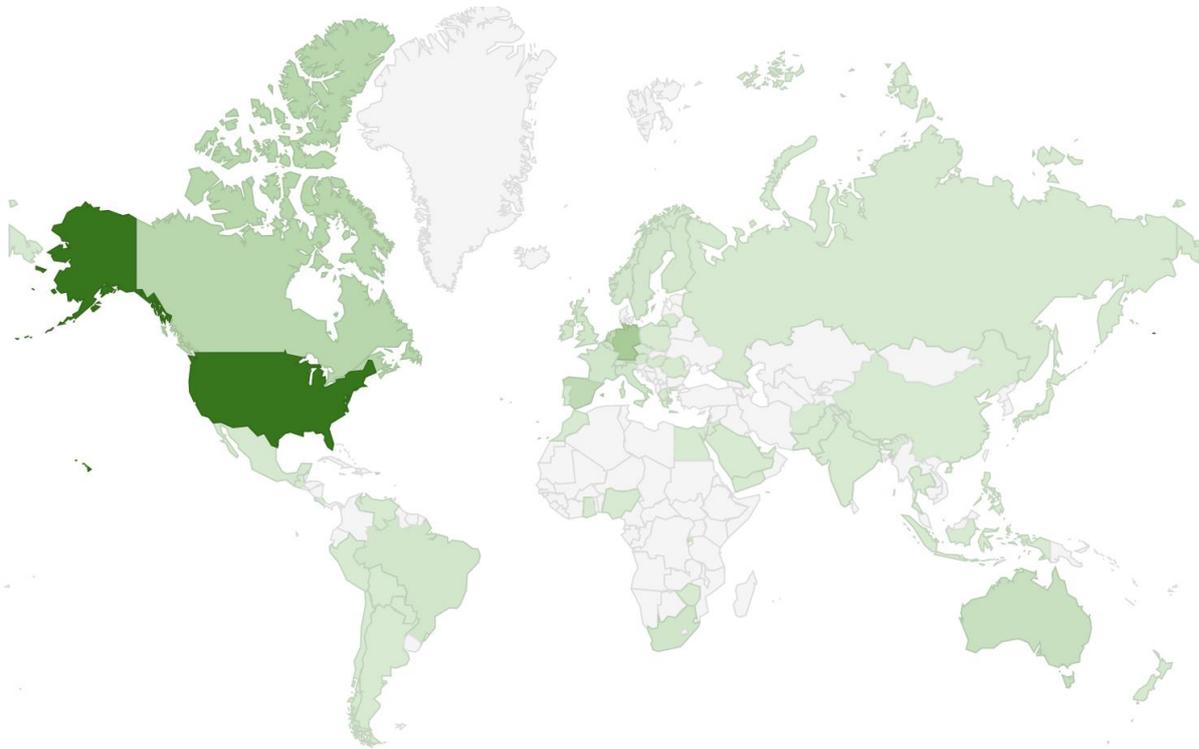


Figure 1. Target hashtag tweets by country.

Table 6

Top 10 Participating Countries by User Counts and Tweets

Country	Users		Total tweets		Tweets with "open" hashtags		Collected tweets per user	
	Total	%	Total	%	Total	%	Total	"Open"
United States	345	40.4%	3,360,641	36.0%	10,856	48.4%	10,001.9	32.3
United Kingdom	82	9.6%	1,124,944	12.1%	2,238	10.0%	14,239.8	28.3
Germany	79	9.2%	594,235	6.4%	2,267	10.1%	7,717.3	29.4
Canada	50	5.8%	516,639	5.5%	1,194	5.3%	10,332.8	23.9
Spain	42	4.9%	819,879	8.8%	455	2.0%	20,497.0	11.4
Netherlands	40	4.7%	348,489	3.7%	906	4.0%	8,712.2	22.7
Australia	27	3.2%	146,122	1.6%	462	2.1%	5,411.9	17.1
South Africa	13	1.5%	111,531	1.2%	644	2.9%	8,579.3	49.5
Belgium	13	1.5%	72,246	0.8%	37	0.2%	5,557.4	2.8
France	12	1.4%	157,136	1.7%	183	0.8%	13,094.7	15.3

Next, when we considered gender, we found that participating males exceeded females by 17.4% overall (cf. Figure 2). To determine whether the proportion of males to females changed from year to

year, we grouped all “open” tweets by coded users according to year and found that participation percentages changed by year (cf. Figure 3 & Table 7). Notably, males were overrepresented in 2010 at a 3 to 1 rate, but this disparity gradually disappeared when in 2013 female participation exceeded male participation (55% to 45%). This gain was gradually lost; however, as rates returned to their 2011 levels in 2016, with males out-tweeting females at a rate of 2 to 1.

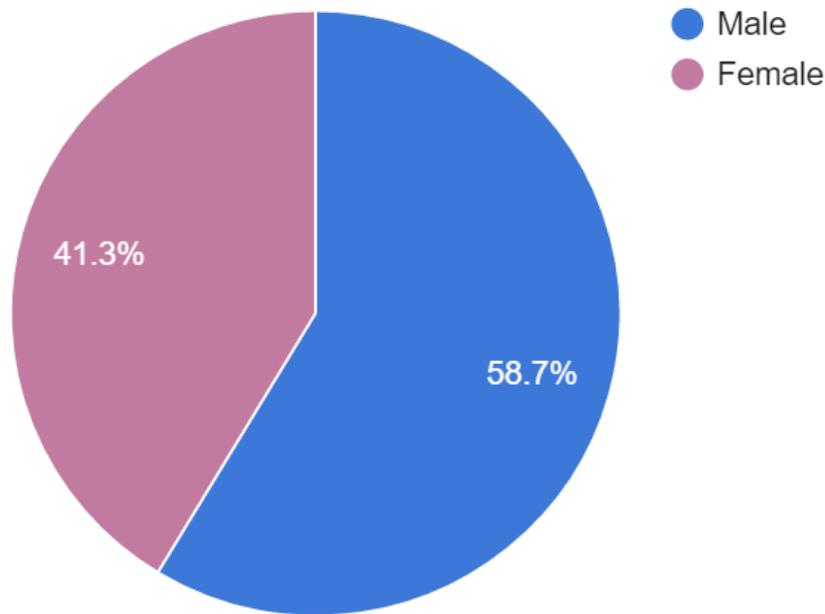


Figure 2. Twitter Participation by Gender.

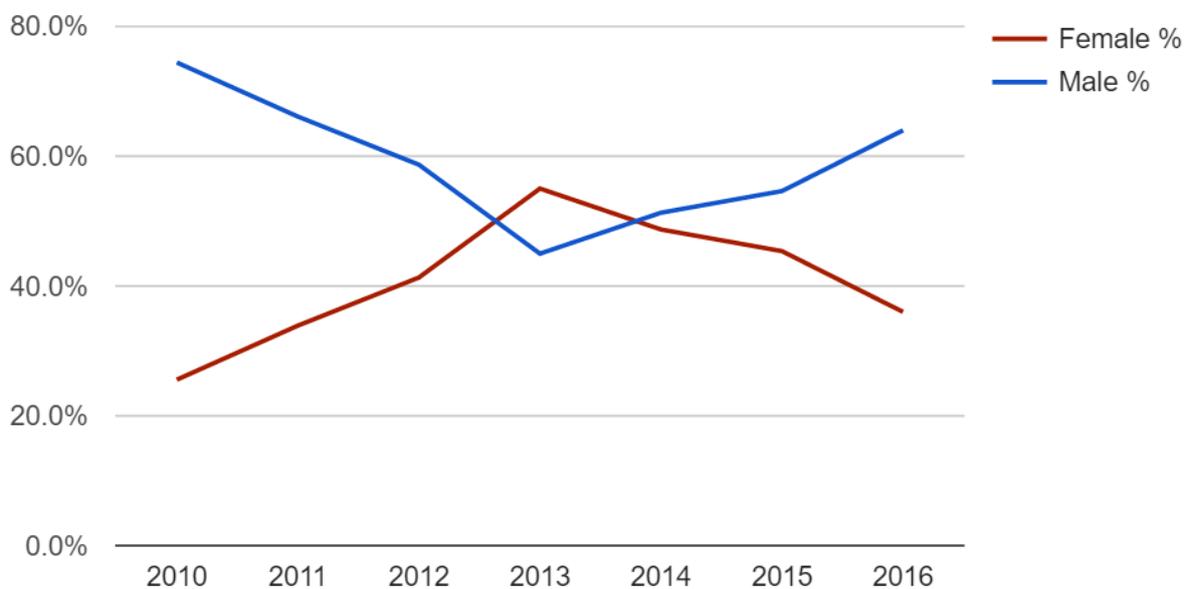


Figure 3. “Open” tweets by sampled user gender each year.

Table 7

“Open” Tweets by Sampled User Gender Each Year

	Female			Male		
	Total	Female %	% Change	Total	Male %	% Change
2010	245	25.6%	-	713	74.4%	-
2011	437	33.9%	8.3%	852	66.1%	-8.3%
2012	1048	41.3%	7.4%	1489	58.7%	-7.4%
2013	1498	55.0%	13.7%	1225	45.0%	-13.7%
2014	1020	48.7%	-6.3%	1074	51.3%	6.3%
2015	1240	45.4%	-3.3%	1493	54.6%	3.3%
2016	591	36.0%	-9.4%	1050	64.0%	9.4%
Average	868.4	43.5%	1.7%	1128	56.5%	-1.7%

Finally, we considered Twitter account type (i.e., individual or organizational) and role (e.g., corporate, educator, librarian) to determine whether user roles and participating organizations had changed over time. Results indicated that among individual accounts, corporate personnel and educators were most prevalent in 2010 but that this changed somewhat over time such that educators, instructional/educational developers, and non-profit personnel had become the most prevalent participants in 2016 (cf. Figure 4).

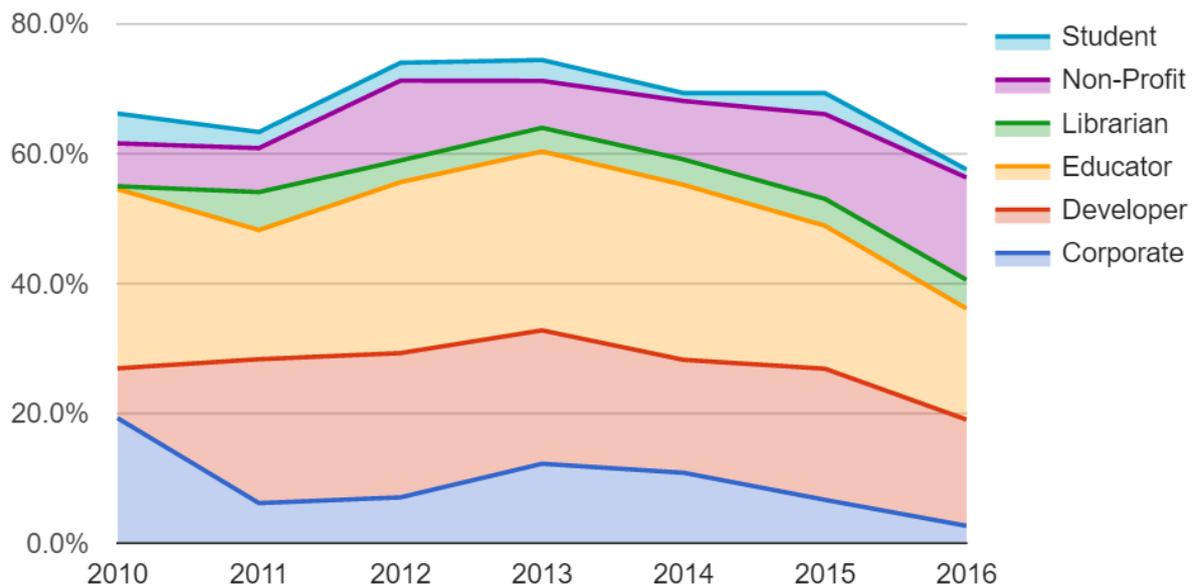


Figure 4. Individual account tweets by year and role.

With regard to organizational accounts, non-profits were the most prevalent in 2010, but this gradually fluctuated such that educational institutions became the most active by 2015, and this continued into 2016 (cf. Figure 5).

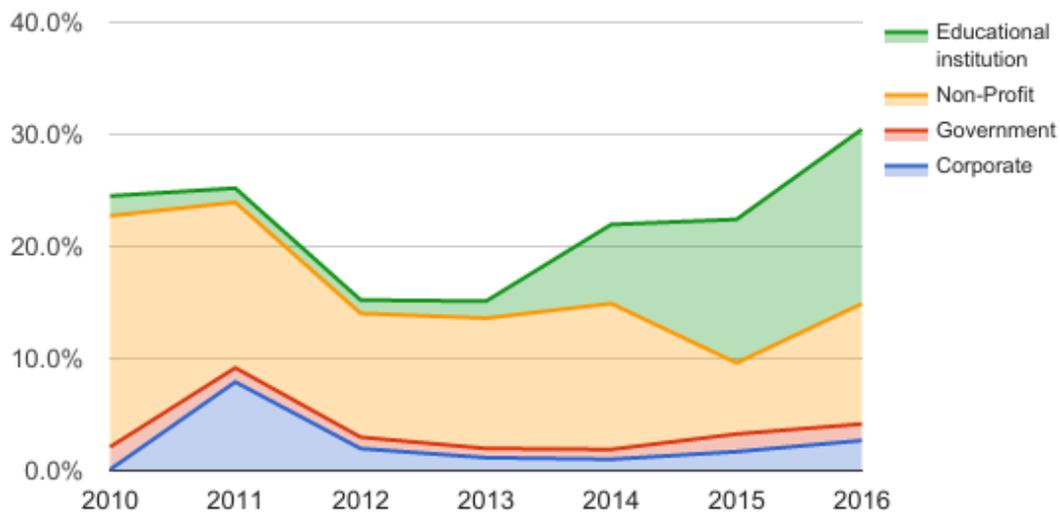


Figure 5. Organizational account tweets by year and role.

RQ3. Discursual Changes Over Time

We approached time changes in three ways. First, we examined the history of tweet category frequencies for the Open Education Conference between 2010 and 2015. Descriptive analysis revealed that participation in the conference backchannel increased each year and that the percentage of tweets in the *content* category also steadily increased in almost every year, from 5.4% in 2010 to 11.9% in 2015 (cf. Table 8). Representation of tweets in the *education* and *practice* categories were extremely low, however, and only fluctuated slightly (less than 1% across all years). Furthermore, an examination of the top hashtags used at each year’s conference revealed that #oer was the most used hashtag at the conference between the years 2010-2015, with the exception of 2010-2011 when it came in second. Thus, we concluded that participants in that conference have historically focused their conversations around content and that this trend has only increased over time.

Table 8

Hashtag Groups by Year

Hashtag	Education	Content	Practice	Top hashtags used within the annual conference
#opened10	0.1%	5.4%	0.7%	drumbeat, oer, ukoer, p2pu
#opened11	0.1%	3.2%	0.0%	ds106radio, oer, occupyopened11, edchat
#opened12	0.2%	5.6%	0.0%	oer, ds106, ds106radio, ukoer
#opened13	0.2%	9.1%	0.0%	oer, oerrhub, ds106radio, mooc
#opened14	0.2%	8.4%	0.0%	oer, openaccess, liboer, oerrhub
#opened15	0.3%	11.9%	0.4%	oer, bccampus, a11y, opentextbooks

Second, we applied this same process to all tweets in the dataset generally, grouping tweets by the year in which they were authored and providing descriptive statistics of hashtag category frequencies. Results indicated that *content* remained the most prominent topical category by a wide margin across

all years (77.7%) but that there had been a slow but steady increase in *practice* tweets from 2009-2016, with an average increase of 0.7% each year (cf. Figure 6).

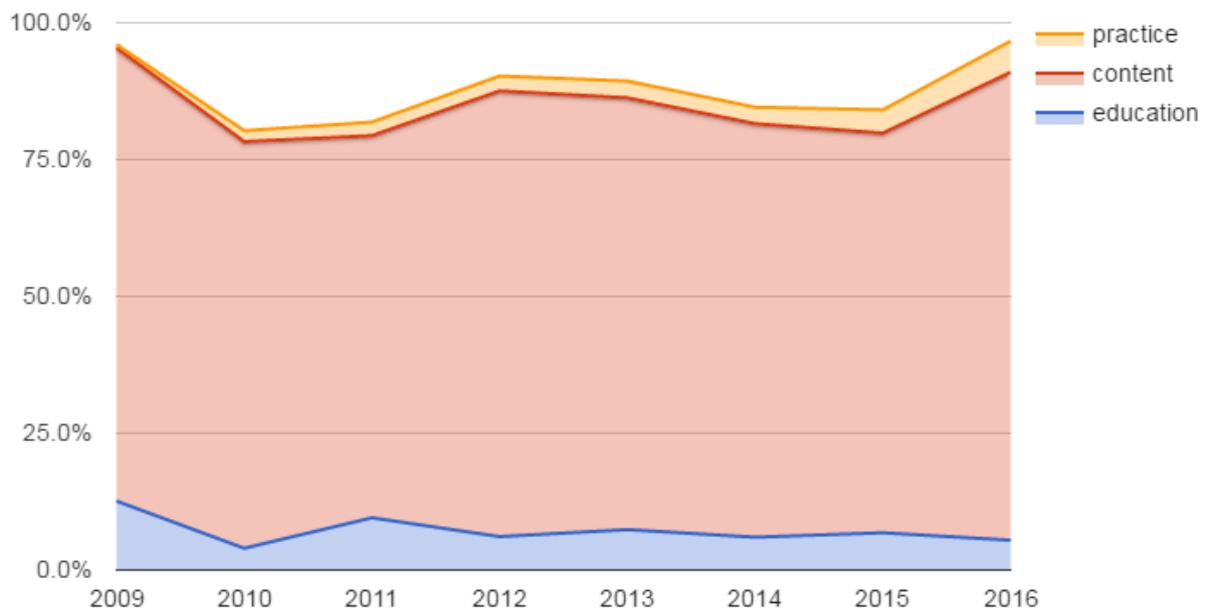


Figure 6. Tweet topical categories by year.

Third, we qualitatively coded the contents of a stratified random sample of tweets ($n = 1,061$) for 2010-2016, which allowed for generalization to the dataset with a 95% confidence level at $\pm 3\%$. Two researchers first discussed a sample of 20 tweets to come to a common understanding of potential codes in the dataset. Next, one of the researchers coded 100 tweets, and the two researchers met to discuss the tweets and the codes. A codebook was generated, and all 1,061 tweets were coded by the first researcher using the codebook. If necessary, new codes were generated as needed, and all tweets were re-examined to explore whether they could be assigned to the new codes. Non-English tweets were also coded after being translated through Google Translate. The two researchers then met again, discussed the codes, and collaboratively reviewed the codes for consistency, accuracy, and potential bias. Sixty assigned codes were modified in this last step. Each tweet was assigned between one and three codes. The codes are shown in Table 9 with sample tweets being edited slightly to safeguard user identity.

Table 9

Sample of Coding as Applied to Tweets

Code	Description	Example
Call for participation	Tweet calls for participation in conference, journal, user group, etc.	The [open education conference] in held in [city] Submit a proposal by [date] here: [URL]
Funding	Tweet provides information related to funding in the field.	A new program provides funding for universities to use OER to improve their courses: [URL]
Inquiry	Tweet asks a question or makes an inquiry.	Are there any good #oer or #openeducation resources for [content area]?
Media	Tweet relates to press coverage or media announcement.	What is the role of open educational resources? via @guardian [URL] #oer
Moocs	Tweet relates to Massive Open Online Courses.	[university] and [university] launch an educational disruption: [URL] [series of open education hashtags]
Other	Tweet is unrelated to openness.	Tying my best friends together by their bathing suit tops. #squareknot #oep
Pedagogy	Tweet is related to open pedagogical practices.	Reflections on the practice of open education: [URL]
Platform	Tweet announces, promotes, or otherwise highlights a digital platform relevant to openness.	Guide on sharing LMS content and activities: [URL] #OER
Policy	Tweet highlights a policy-related item.	Campaign to encourage the adoption of openness by the US Dept of Edu: [URL] #edchat #OER
Reflection	Tweet observes or reflects on openness or aspects of it, such as open pedagogy.	The right to remix is important! [relevant hashtags]
Research	Tweet comments on or links to research relevant to openness.	#OER symposium & research in [region of the world]: [URL]
Resource	Tweet provides a resource related to openness.	X tools for identifying open educational resources: [URL]
Textbooks	Tweet relates to open textbooks.	Open textbooks in [region] lead to affordability: [URL] #OER #highered

Results indicated that the most common tweet theme was *resources* (39.5%) followed by *reflections* (23.3%; cf. Figure 7). *Pedagogy* and *policy* were both uncommon (2.2% and 3.1%). Taken together, results from all three approaches revealed the same theme: most conversations historically had focused on content, and relatively few had dealt with practice or broader issues, but there were small, steady trends that suggested that these topics might be gaining traction.

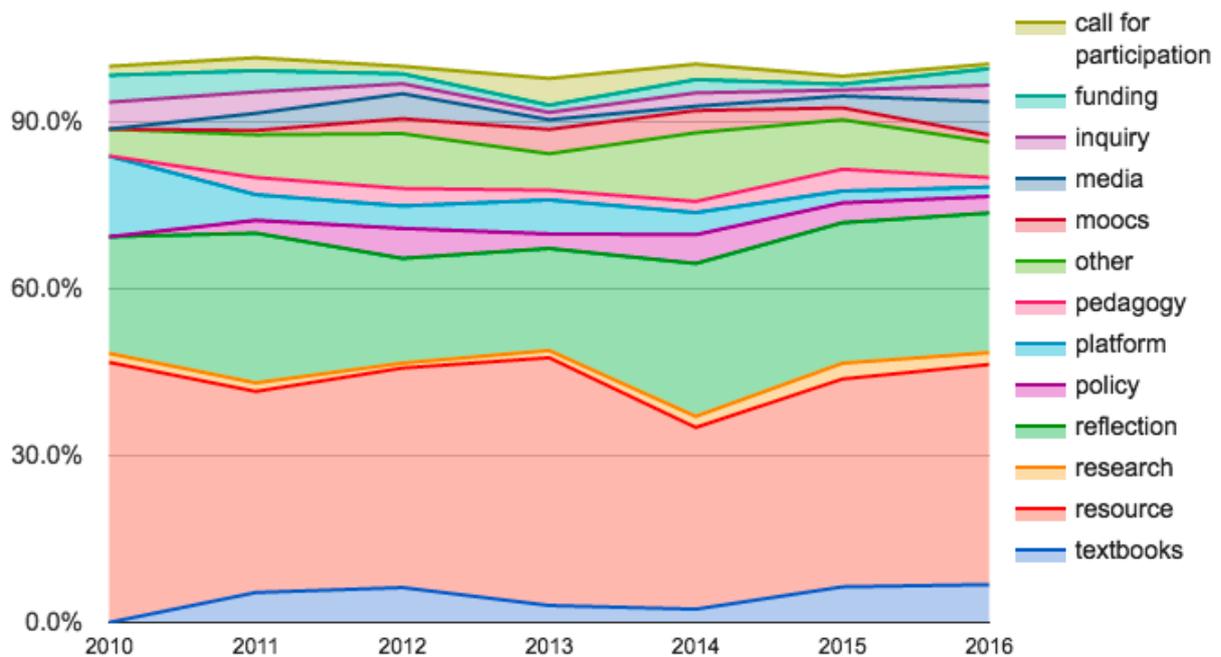


Figure 7. Qualitatively coded topics of tweets per year.

Discussion and Implications

These analyses show that openness on Twitter is largely discussed in terms of content. Over the sample period, open content dominated the discourse. This finding holds true even when tweet frequencies increased over time and participant frequencies and demographics changed somewhat. In other words, content monopolizes the discourse and persists in the face of changes in participation. This finding is reflective of the results reported by dos Santos (2008) who found that OER initiatives focused primarily on content provision, and open content currently seems to be central to the concept of open education. This finding may demonstrate the significance of open content to the openness movement and the ways that individuals come to learn about open education. On the other hand, while open content is important, this finding might also indicate how continued emphasis on open content might displace conversations around emerging aspects of open education, such as pedagogy and policy. Some questions that practitioners and researchers in the field may need to ask with respect to this finding include: Why is open content central to open education conversations? Is open content much easier to understand than other concepts associated with openness? Could open content be considered the Trojan horse of openness, in that it allows advocates and researchers to advance the cause of openness? Alternatively, we could ask whether this continued emphasis is detrimental to the open education movement. Do open educators become complicit in perpetuating content-centric pedagogical practices by continuing to focus on content as opposed to open pedagogies or open practices? If the community deems open pedagogy to be significant to the movement, we recommend greater advocacy and conversations around this aspect of openness on Twitter and elsewhere.

The open education community seems to recognize that a tension exists between open educational practices and OER, where the former represents a revolutionary approach to education and the latter

represents an evolutionary stance (Jhangiani, 2017; Wiley, 2016). Both evolutionary and revolutionary approaches can be framed as “practical and effective means for achieving scholarly aims that are socially valuable” which is one of the assumptions underpinning the open movement (Veletsianos & Kimmons, 2012, para. 21). However, the results presented here suggest that the discourse on Twitter focuses on pragmatism. Future research efforts may investigate the degree to which these results apply to the broader non-Twitter community, such as for example by surveying community members and identifying how open education is conceptualized by its members and how such conceptualizations have changed over time. If future research results confirm the findings presented here, the corollary is that open education researchers might be able to use Twitter to capture the pulse of the community. If future research disconfirms these findings, further investigation will be necessary to understand the role that Twitter serves in the open education community or the participants that make use of it. Nonetheless, educational research that uses large amounts of social media data as a source is an emerging methodological area, and there is a significant need to develop innovative techniques and approaches to analyzing these data sources including novel methods of extracting, interpreting, and handling of social media activity data (Weller, Bruns, Burgess, Mahrt, & Puschmann, 2014).

While tweet codes reinforce the notion that content is significant to the open education community, they also reveal some additional interesting patterns. Significantly, we observe that Twitter serves multiple purposes in the community. For example, it circulates calls for participating in various happenings in the open education community, such as conferences, but also provides a space for individuals to reflect on the topic and share relevant resources. Seasoned social media users will find these results unsurprising. However, given the lack of studies examining use of Twitter over time, it is worth noting how these activities have shifted over the duration of this study. For instance, the time period investigated coincides with the rise and fall of interest in MOOCs, and this is revealed in the results which show that mentions of MOOCs were nearly non-existent in 2010, at their peak in 2012-2013, and have diminished drastically by 2016. A similar pattern emerges with open textbooks: While mentions were non-existent in 2010, they have emerged in popularity and appear prominently in the dataset in 2016. Thus, we see that time-series analyses of Twitter data might yield worthwhile insights to understand ebbs and flows in community discourse.

One significant caveat of this discussion relates to Twitter itself. Prior research (e.g., Kimmons & Veletsianos, 2016; Veletsianos & Kimmons, 2016) shows that individual scholars and higher education institutions mostly use Twitter to share resources and to broadcast information. Therefore, one could argue that Twitter, with its resource-sharing affordances, encourages individuals to share content. On the other hand, Twitter is agnostic as to the type of content that is being shared, and as a result, if conversations in the community were shifting to particular topics over time (e.g., greater emphasis on open textbooks or open practices), our analytic methods would have captured those shifts.

And finally, inherent in the idea of openness is the attitude that all should be able to participate, share, and reap the benefits of open communities. However, our results on the national and gender demographics of participants raises questions as to the ongoing diversity of the open education community. Notably, the U.S. dominates English-speaking conversations about openness, and though this might be somewhat expected given the relative size of that country, overrepresentation of males in the community should lead us to consider whether there are social or other barriers of entry for female participants. Interestingly, females gradually gained traction in the community and even overtook males in 2013, but this trend swiftly reversed the following year, and males now participate more than

females at a rate of 1.8 to 1. The reasons for this up- and then down-turn is unclear, but it may be connected to the gradual increase in educators up until 2013 and then the institutionalization of openness that began in 2014 as more educational institutions became involved. At any rate, if diversity of perspectives would be valued in any community, we would anticipate that this would be the case within open communities, so we suggest that leaders in this area should consider ways to better understand this issue and the reasons why many who should be participating in these conversations may not.

Limitations and Delimitations

There are two major limitations facing this study. First, the study began with bounding tweet collection by a set of *a priori* hashtags relevant to the topic. This was necessary for bounding and focusing our data collection processes, but it could be that there are openness conversations on Twitter occurring outside of these hashtags that were not included. Importantly, all of our included hashtags were anglophonic. For this reason, the reader should determine whether our *a priori* hashtags are representative enough to apply to openness generally or if there are any theoretical limitations in the study resulting from this necessary focus.

The second limitation involved the collection of historical Twitter data. There are restrictions imposed on the use of the Twitter API, and as a result, not all tweets posted can be retrieved for analysis. This study's results may underestimate the activity of Twitter use for openness as well as activity on particular hashtags. Nonetheless, this study provides an analysis of the most extensive and complete dataset of historical open education tweets to date and even if the dataset is necessarily incomplete, it is reflective of Twitter content and participation patterns.

Conclusion

In this paper, we investigated the discourse surrounding openness on Twitter and examined how that discourse developed over time. Most significantly, we found that more individuals are discussing more topics related to openness over time, but that the conversation seems to remain fixed on content. Is content the most powerful weapon that the open community has in its pursuit for democratizing education? Though our findings may be reflective of a certain subculture in the open community, like others (Deimann & Farrow, 2013; OPAL, 2011; Veletsianos & Kimmons, 2016; Weller, de los Arcos, Farrow, Pitt, & McAndrew, 2015), we believe that the community should strive to diversify further and consider ways in which the discourses of open education may evolve to further enhance teaching and learning practices.

Acknowledgements

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Data Availability

Data from this study is available from http://roycekimmons.com/open_datasets and is licensed under a Creative Commons Attribution (CC BY) 4.0 International License.

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Status of e-learning Quality in Kenya: Case of Jomo Kenyatta University of Agriculture and Technology Postgraduate Students



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Abstract

There is a substantial increase in the use of learning management systems (LMSs) to support e-learning in higher education institutions, particularly in developing countries. This has been done with some measures of success and failure as well. There is evidence from literature that the provision of e-learning faces several quality issues relating to course design, content support, social support, administrative support, course assessment, learner characteristics, instructor characteristics, and institutional factors. It is clear that developing countries still remain behind in the great revolution of e-learning in Higher Education. Accordingly, further investigation into e-learning use in Kenya is required in order to fill in this gap of research, and extend the body of existing literature by highlighting major quality determinants in the application of e-learning for teaching and learning in developing countries. By using a case study of Jomo Kenyatta University of Agriculture and Technology (JKUAT), the study establishes the status of e-learning system quality in Kenya based on these determinants and then concludes with a discussion and recommendation of the constructs and indicators that are required to support quality teaching and learning practices.

Keywords: e-learning, learning management system, LMS, course design, content support, social support, administrative support, learner characteristics, instructor characteristics, course assessment, institutional factors

Introduction and Background

According to the Organization for Economic Co-operation and Development (OECD), many countries are currently overseeing a massive expansion of higher education through the use of information and communication technologies (ICTs). However, improving quality is one the most significant challenges for Higher Institutions of Education (HEIs), particularly in developing countries. This is as a result of enrollment expansion characterized by a range of weak inputs such as weak academic preparation for incoming students, lack of financial resources, inadequate teaching staff, poor remuneration of staff, and inadequate staff qualifications (Johanson, Richard, & Shafiq, 2011; United States Agency for International Development [USAID], 2014; Aung & Khaing, 2016).

Recent studies show that ICT integration in education through e-learning are facing numerous challenges associated with quality. For example, studies in Kenya confirmed that there are quality issues linked to inadequate ICT and e-learning infrastructure, financial constraints, expensive and inadequate Internet bandwidth, lack of operational e-learning policies, lack of technical skills on e-learning and e-content development by teaching staff, inadequate course support, lack of interest and commitment among the teaching staff, and longer amounts of time required to develop e-learning courses (Tarus, Gichoya, & Muumbo, 2015; Makokha & Mutisya, 2016).

A related study (Chawinga, 2016) in Malawi on increasing access to university education through e-learning observed that the greatest obstacles to e-learning use were: Lack of academic support (77.6%); Delayed end of semester examination results (75.5%); Class too large (74.3%); Delayed feedback from instructors (72.6%); Failure to find relevant information for studies (67%); Poor learning materials/manuals (33.1%); and Lost assignments and grades (19.5%).

In light of all these challenges, it is clear that developing countries still remains behind the great revolution of ICTs in Higher Education. Accordingly, further investigation into e-learning use in Kenya is required in order to fill in this gap of research, and extend the body of existing literature by highlighting major quality determinants in the application of e-learning for teaching and learning. The study proposes to determine the factors that determine the quality of e-learning systems based on empirical literature, the Quality Matters Rubric Standards (QMRS) and the Criteria for Evaluating the Quality of Online Courses by Wright (QMRS, 2014; Wright, 2014). The expected result of this study is the identification of the key constructs and indicators that determine quality and then use these factors to establish the status of e-learning system quality of JKUAT.

Problem Statement

The importance of addressing quality in an e-learning system is crucial and many of the scholars referred to above argue that it has a role to play in increasing the success rate of e-learning system implementation and use. Majority of e-learning initiatives in developing countries are grappling with providing quality (Ssekakubo, Suleman, & Marsden, 2011; Tarus, Gichoya, & Muumbo, 2015; Makokha & Mutisya, 2016; Chawinga, 2016; Kashorda & Waema, 2014). This prompted the researcher to review the existing literature, obtain the quality determinants of e-learning, and use the determinants to establish the quality

status of JKUAT e-learning system based on the perceptions and views of JKUAT students, instructors and administrators.

Research Objectives

The following objectives were formulated for the research:

1. Identify the e-learning system constructs and indicators based on existing literature, guidelines and quality rubrics that determine the quality of e-learning systems in developing countries.
2. Use the identified quality constructs and indicators to determine the status of quality of JKUAT e-learning system in Kenya.

Literature Review

Status of e-Learning in Kenya

Kenya had 33 public and 17 private universities Commission for University Education (CUE) by the year 2015 (CUE, 2015). Most of these institutions had started offering a few courses in e-learning which were mainly Learning Management System (LMS) supported asynchronous and blended in nature (Ssekakubo et al., 2011). However, most of the universities which have adopted e-learning have not invested sufficiently in the necessary infrastructure and training in course development that can breed success (Kashorda & Waema, 2014).

Some studies have found out that the main challenges affecting e-learning include but are not limited to: inadequate ICT and e-learning infrastructure, financial constraints, lack of affordable and adequate Internet bandwidth, lack of operational e-learning policies, lack of technical skills on e-learning, and e-content development by the teaching staff (Ssekakubo et al., 2011; Tarus, Gichoya, & Muumbo, 2015; Makokha & Mutisya, 2016; Muuro et al., 2014).

Related Work

In a study on the structural relationships of environments, individuals, and learning outcomes in e-learning, Lim, Park, & Kang (2016) observed that content quality and system quality were significant in terms of eliciting intrinsic and extrinsic motivation. Furthermore, academic self-efficacy and computer self-efficacy were affected by content quality and system quality, respectively. Both the Quality Matters Rubric Standards (QMRS, 2014) and the Criteria for Evaluating the Quality of Online Courses (Wright, 2014) introduced the indicators for measuring the quality of e-learning in the context of course design and development and course assessment.

These findings indicate that well-designed courses, content, and assessments, as well as adequate infrastructure, lead to quality and increases learning motivation that is essential for successful e-learning use. Additionally, the content once designed and developed must be supported with announcements and reminders, multimedia applications such as audio and animations, learning activities that are realistic or

authentic and constructive feedback from instructors (QMRS Higher Education Rubrics, 2014; Wright, 2014; Makokha & Mutisya, 2016; Tarus, Gichoya, & Muumbo, 2015).

Other studies found out that both social and administrative support enhances quality. Socially, informational support, instrumental support, affirmation support, and emotional support were all found to be influential (Weng & Chung, 2015; Munich, 2014; Muuro et al., 2014; Queiros & de Villiers, 2016). Similarly, registration support, orientation, and a dedicated call center were given as some of the key indicators that determine success or failure (Tarus, Gichoya, & Muumbo, 2015; Makokha & Mutisya, 2016).

In a related studies, Arinto (2016) and Queiros and de Villiers (2016) agreed, in principle, that three facets need to be in place in order to better prepare both the lecturer and student for online learning: strong social presence (through timely feedback, interaction with facilitators, peer-to-peer contact, discussion forums, and collaborative activities); technological aspects (technology access, online learning self-efficacy, and computer self-efficacy); and learning tools (websites, then video clips).

Other factors hindering e-learning were observed to comprise of low internet bandwidth, insufficient financial support, inadequate training programs, lack of technical support, lack of ICT infrastructure, ambiguous policies, and objectives, with the key issues identified by the majority of participants as lack of training programs and inadequate ICT infrastructure (Azawei et al., 2016).

The role played by user characteristics such as learners and instructors also proved to be critical in an e-learning setup. Factors such as: computer and internet experience, passion about e-learning, motivation from instructors, for the learners and self-efficacy, training, motivation, and incentives for the instructor all contribute to the quality of an e-learning system (Baloyi, 2014a; Muuro et al., 2014; Baloyi, 2014b; Queiros & de Villiers, 2016; Azawei et al., 2016; Makokha & Mutisya, 2016; Mayoka & Kyeyune, 2012; Kisanga, 2016).

Key Factors for Evaluating e-Learning System Quality

From the literature review on the status of e-learning in Kenya and other developing countries, it can be deduced that there are eight factors that influence the quality of e-learning in developing countries: course design, content support, social support, administrative support, course assessment, learner characteristics, instructor characteristics, and institutional factors. These factors are summarized in Table 1.

Table 1

Key Determinants of Quality

Constructs	Indicators	Author
1 Course Design	Course information, course structure, course layout.	QMRS Higher Education Rubrics (2014); Wright (2014); Makokha & Mutisya (2016); Tarus, Gichoya, & Muumbo (2015).
2 Content support	Announcements & reminders, use of multimedia, constructive feedback, authentic learning activities.	QMRS Higher Education Rubrics (2014); Wright (2014); Makokha & Mutisya (2016); Tarus, Gichoya, & Muumbo (2015).
3 Social Support	Informational support, instrumental support, affirmation support, emotional support.	Weng & Chung (2015); Munich (2014); Muuro et al.(2014); Queiros & de Villiers (2016).
4 Administrative Support	Registration support, orientation, call center.	Tarus, Gichoya, & Muumbo (2015); Makokha & Mutisya (2016).
5 Assessment	Assessment policies, assignments management, timely feedback, grades management.	Chawinga (2016); Arinto (2016); Makokha & Mutisya (2016); Wright (2014).
6 Institutional Factors	Policies, funding, infrastructure, culture.	Kashorda & Waema (2014); Ssekakubo et al. (2011); Tarus, Gichoya, & Muumbo (2015); Bagarukayo & Kalema (2015); Aung & Khaing (2016).
7 Learner characteristics	Computer and internet experience, passion about e-learning, motivation from instructors, good access to university e-learning system.	Baloyi (2014a); Muuro et al. (2014); Baloyi (2014b); Queiros & de Villiers (2016).
8 Instructor characteristics	Self-efficacy, training, motivation, incentives, experience.	Azawei et al. (2016); Makokha & Mutisya (2016); Mayoka & Kyeyune (2012); Kisanga (2016).

Methodology

Research Design

Research design can be described as a general plan about what needs to be done to answer the research questions (Saunders, Lewis, & Thornhill, 2012). Research design can be divided into three groups: descriptive, casual, and exploratory. Descriptive research is usually concerned with describing a population with respect to important variables. Causal research is used to establish cause-and-effect relationships between variables. The choice of the most appropriate design depends largely on the objectives of the research.

Descriptive research was used in this study as it can be used to describe the factors that affect e-learning system quality. Descriptive research can be classified as cross-sectional studies (CS) or longitudinal

studies (LS). CS measure units from a sample of the population at only one point in time while LS repeatedly measure the same sample units of a population over a period of time. CS was used as it has been proved to be an effective method for providing participants views and perspectives in a study (Gay, Mills, & Airasian, 2009).

Target Population and Sample Size

The study was done at JKUAT SODEL between December 2nd and December 20th, 2016. SODEL has three intakes in any given academic year: January, May, and September. Intakes admit candidates from Certificate, Diploma, Bachelor, and Master's programmes. Although SODEL currently has an e-learning population of about 700 students in total, the study targeted a sample population of around 350 consisting of postgraduate students (315), instructors (34) and the e-learning director (1). The sample size was determined using Kjericie and Morgan's sample size table (Kjericie & Morgan, 1970). With an expected 95% confidence level, the table yielded a sample size of 200.

Data Collection Instruments

Survey methods can be broadly categorized as: mail survey, telephone survey, and personal interview (Neuman, 2014). The study adopted a mixed survey (qualitative and quantitative) using questionnaires and interviews to gather data. The questionnaires adopted a 5-point Likert scale consisting of strongly disagree, agree, neutral agree, and strongly agree. Out of the 200 correspondents, 180 were students and the remaining 20 were to be selected from instructors and administrators. The questionnaires and the interview themes used in the study are found in the appendices (Appendix A).

Data Collection and Preparation

The questionnaires were hand delivered to the students, instructors, and administrators during the end semester examinations with the help of research assistants. The researcher collected them back after a period of two weeks. All the interviews, face-to-face in nature were conducted with the help of the research assistants and were audio recorded with each session lasting for about 45 minutes.

Qualitative Data was prepared through content analysis by categorizing the transcribed data according to the study objectives constructs and indicators. The analysis process applied both inductive and deductive reasoning to obtain correct interpretations from the data. Coding of data was done using SPSS program version 23.0. The coding was based on the eight constructs and 31 indicators.

Once all the data had been coded, the instrument was assessed to check whether it exhibited adequate reliability and validity. Reliability test done to verify internal consistency was measured using Cronbach's alpha ($\alpha \geq 0.7$). Validity test was done using construct validity (CV) using factor loading (FA ≥ 0.4), Average Variance Extracted (AVE ≥ 0.5), and composite reliability (CR ≥ 0.7) (Fornell & Larcker, 1981; Hair et al., 2010).

Data Analysis

After preparing and assessing the data collection instruments, analysis was done using descriptive statistics, frequencies, and factor analysis in order to determine the factors that determine the quality of

e-learning. The frequency results were used to rate the students, instructors and administrators views about the status of e-learning quality in JKUAT.

Results

Summary of the Respondents

The total responses from questionnaires and interviews were 200. This consisted of postgraduate students in Leadership and Governance, Procurement and Logistics Management, Business Administration, Project Management, Human Strategic Management, Entrepreneurship, and IT, totaling 180. The rest totaling 20 included the instructors (19) and one administrator (e-learning director). Table 2 summarizes the distribution of the sample by programmes offered at JKUAT.

Table 2

Sample Distribution by Programme

Programme	Enrolment	Sample Size	Percent
Msc. in Leadership and Governance	50	25	14%
Msc in Procurement and Logistics Management	45	22	12%
Msc in Business Administration	60	30	17%
Msc in Project Management	50	25	14%
Msc in Human strategic management	40	21	12%
Msc in entrepreneurship	40	21	12%
Msc in IT	30	17	9%
instructors	34	19	11%
E-learning deputy director	1	1	1%
Total	350	200	100

Instrument Assessment

Reliability and validity. The reliability of the 31 indicators in the questionnaire gave a value of 0.829. Since this Alpha (α) value was higher than 0.7, the items in the questionnaire had a good internal consistency and were therefore reliable. The individual alpha for the constructs were also greater than 0.7 which was a good sign. Convergent validity test on the eight constructs exceeded the recommended thresholds of >0.4 for Factor Loading (FL), >0.5 for Average Variance Extracted (AVE), and >0.7 for Composite Ratio (CR). All the constructs and indicators have convergent validity. The measurements are summarized in Table 3.

Table 3

Reliability and Convergent Validity

Constructs	Indicators	Factor loading	Cronbach's alpha	AVE	CR	Convergent validity
Course development	CD1	0.790	0.856	0.728	0.818	OK
	CD2	0.831				
	CD3	0.529				
	CD4	0.66				
Content support	CS1	0.725	0.822	0.719	0.831	OK
	CS2	0.706				
	CS3	0.672				
	CS4	0.701				
Social support	SS1	0.551	0.848	0.734	0.899	OK
	SS2	0.665				
	SS3	0.833				
	SS4	0.765				
Administrative support	AS1	0.988	0.812	0.837	0.910	OK
	AS2	0.7071				
	AS3	0.922				
	AS4	0.606				
Institutional factors	IF1	0.592	0.783	0.885	0.889	OK
	IF2	0.657				
	IF3	0.824				
	IF4	0.799				
Course assessment	CA1	0.876	0.775	0.762	0.786	OK
	CA2	0.833				
	CA3	0.723				
Learner characteristics	LC1	0.742	0.804	0.778	0.766	OK
	LC2	0.702				
	LC3	0.815				
	IC4	0.648				
Instructor characteristics	IC1	0.692	0.811	0.823	0.843	OK
	IC2	0.844				
	IC3	0.763				
	IC4	0.715				

Status of e-Learning System Quality: Results

The status of e-learning system quality as expressed by the respondents at JKUAT was obtained through frequencies from descriptive statistics based on the quality constructs and indicators. These results are shown in Tables 4-11.

Student Results

Course design.

Table 4

Course Design Factors That Determine E-learning Quality

Course design	Strongly disagree	Disagree	Undecided	Agree	Strongly agree
	N (%)	N (%)	N (%)	N (%)	N (%)
Course information	5(3%)	20(12%)	15(9%)	92(58%)	29(18%)
Course structure	9(6%)	88(54%)	14(9%)	18(11%)	32(20%)
Course layout	25(16%)	30(17%)	20(12%)	77(48%)	9(6%)
Course organization	32(20%)	58(36%)	23(14%)	28(17%)	18(11%)

Number of respondents: (N = 180)

The results on Table 4 shows that over 54% of the students were happy with the course information provided and the course layout of the LMS. However, 60% did not like the course structure while 56% did not like the course organization.

Below are some of the comments from the students: “(a)lthough our content has no issues with spelling, grammar and accuracy, they rarely include more relevant examples to help us understand the subject. We always have to look for more materials to helps us understand better.”

Content support.

Table 5

Content Support Factors That Determine E-learning Quality

Content support	Strongly disagree	Disagree	Undecided	Agree	Strongly agree
	N (%)	N (%)	N (%)	N (%)	N (%)
Announcements provided	18(11%)	26(16%)	14(9%)	61(38%)	42(26%)
Reminders provided	11(7%)	81(25%)	26(16%)	56(35%)	27(17%)
Multimedia has been used	40(21%)	51(32%)	19(12%)	37(23%)	14(9%)
There is constructive feedback	37(23%)	53(33%)	23(14%)	31(19%)	17(11%)

Number of respondents: (N = 180)

The results on Table 5 shows those over 50% were happy about the provision of announcements and reminders through emails on their courses. However, over (53%) complained about lack of constructive

feedback and inadequate use of multimedia. Below are some of the comments from respondents: “(t)he notes that our lectures upload are merely pdfs with without an inclusion of audio, video or animations. We normally download these pdfs and read them offline. Our lectures rarely pick our phones or reply our emails.”

Social support.

Table 6

Social Support Factors That Determine E-learning Quality

Social support	Strongly disagree	Disagree	Undecided	Agree	Strongly agree
	N (%)	N (%)	N (%)	N (%)	N (%)
Information support from peers	39(24%)	53(33%)	13(8%)	27(17%)	29(18%)
Online library support (instrumental)	35(22%)	23(14%)	26(16%)	45(28%)	32(20%)
Emotional support from family & peers	47(29%)	52(32%)	22(14%)	26(16%)	14(9%)
Affirmational support by working in groups	34(21%)	60(37%)	18(11%)	36(22%)	13(8%)

Number of respondents: (N = 180)

The results on Table 6 shows that only instrumental or library support scored over (45%) implying the students heavily relied on online library for social support. The rest scored below (40%) with information support (35%), emotional support (25%), and affirmation support (30%). Most of the students stressed that it was difficult to interact socially as both the LMS course forum and chat were rarely used by both the students and the instructors. This is how one student commented, “we have just formed a’s app group this week when we came for our semester examinations. Most of us are meeting for the first time. We hope for better interaction next semester through What’s app group.”

Administrative support.

Table 1

Administrative Support Components That Determine E-learning Quality

Administrative support	Strongly disagree	Disagree	Undecided	Agree	Strongly agree
	N (%)	N (%)	N (%)	N (%)	N (%)
Course registration	9(5%)	32(20%)	21(13%)	70(44%)	29(18%)
Academic advice	18(11%)	27(17%)	23(14%)	60(37%)	33(21%)
Campus orientation	11(7%)	26(16%)	29(18%)	55(34%)	40(25%)
Phone call support	38(24%)	50(31%)	24(15%)	31(19%)	18(11%)

Number of respondents: (N = 180)

The results on Table 7 shows that close to 60% of the students commended the support they got during on-campus orientation, course registration, and academic advice they received when joining the course. However, 56% complained about the difficulties experienced when trying to make phone calls to the e-learning department at JKUAT. This was evident from the following response from a respondent:

(I)magine I had to travel all the way from Busia Town to Nairobi City (a distance of 358km) to come and confirm my fee balance after I was told I could not sit for examinations yet I had cleared all my fees. I was told to come personally as I could not be assisted through phone calls.

Course assessment.

Table 8

Course Assessment Components That Determine E-learning Quality

Course assignment	Strongly disagree	Disagree	Undecided	Agree	Strongly agree
	N (%)	N (%)	N (%)	N (%)	N (%)
Lost grades	21(13%)	27(17%)	26(16%)	49(31%)	37(23%)
Assignment management	15(9%)	32(20%)	24(15%)	58(36%)	32(20%)
Assessment & feedback	22(14%)	40(25%)	23(14%)	42(26%)	34(21%)
Assessments & content	42(26%)	20(12%)	17(11%)	50(31%)	32(20%)

Number of respondents: (N = 180)

The results on Table 8 show that 51% of the students agree that the content taught is enough to undertake assessments. Another 47% have no problem with lack assessment feedback such as CATs and assignments. Only 30% of the students supported claims that grade loss or misplacement was a problem in JKUAT, while 56% were satisfied with assignment management.

Learner characteristics.

Table 9

Learner Characteristics Components That Determine e-Learning Quality

Learner characteristics	Strongly disagree	Disagree	Undecided	Agree	Strongly agree
	N (%)	N (%)	N (%)	N (%)	N (%)
I enjoy using e-learning	29(18%)	47(29%)	19(12%)	48(30%)	18(11%)
Instructors motivate us	34(21%)	44(27%)	13(8%)	52(32%)	18(11%)
I have internet & computer experience	26(16%)	34(21%)	17(11%)	45(28%)	39(24%)
We have been trained on E-learning	37(23%)	50(31%)	21(13%)	40(25%)	13(9%)

Number of respondents: (N = 180)

The results on Table 9 shows that those who enjoy e-learning are 41% while those who do not are 47%. Majority (52%) also reported having useful internet and computer experience while over 50% lamented lacking LMS training as well lack of motivation from instructors.

Instructor characteristics.

Table 20

Instructor Characteristics That Determine E-learning Quality

Instructor characteristics	Strongly disagree	Disagree	Undecided	Agree	Strongly agree
	N (%)	N (%)	N (%)	N (%)	N (%)
We are trained on LMS	4(20%)	7(31%)	3(19%)	3(15%)	3(15%)
We are trained I course development	5(25%)	6(30%)	2(10%)	5(25%)	3(10%)
We are given incentives	7(35%)	8(40%)	-	3(15%)	2(10%)
We attend workshops/seminars	4(20%)	6(30%)	3(15%)	4(20%)	3(15%)

Number of respondents: (N = 20)

The results on Table 10 show that over 50% of are not satisfied with training on LMS and course development. Over 50% were also dissatisfied with provisions for attending workshops or seminars on e-learning as well as incentives at work. One instructor made this comment:

If the university can include e-learning course development as part of the workload that is considered for payment by the university then we would all be willing to sacrifice out time for it. Otherwise nobody wants to work for free.

Institutional factors.

Table 31

Institutional Factors That Determine E-Learning Quality

Institutional factors	Strongly disagree	Disagree	Undecided	Agree	Strongly agree
	N (%)	N (%)	N (%)	N (%)	N (%)
Funding	5(25%)	6(30%)	1(5%)	5(26%)	3(13%)
Infrastructure	4(20%)	5(25%)	3(15%)	4(20%)	4(20%)
Culture	6(30%)	7(35%)	1(5%)	4(20%)	2(10%)
Policies	5(25%)	5(25%)	-	5(25%)	6(25%)

Number of respondents: (N = 20)

The results on Table 11 shows that 55% of the respondent's state that the university lacks funding, infrastructure, and polices to manage e-learning. Another 65% adds that the culture of the university does not support e-learning.

Discussions

This study set out to identify the e-learning system quality factors that determine the quality of e-learning in developing countries and also use the factors to determine the status of e-learning system quality at JKUAT using empirical data. From the literature review, it was established that there are indeed eight factors that determine the quality of e-learning systems: course design, course support, social support, administrative support, course assessment, learner characteristics, instructor characteristics, and institutional factors. The status of e-learning system quality at JKUAT was determined based on these factors with the following findings.

Course Design

The findings revealed that JKUAT e-learning courses had a good layout and adequate course information. This conforms to the findings by Wright (2014) who established that the institution providing e-learning must provide a good LMS interface and adequate course information. However, the students were not satisfied with the structure and organization of the courses. The students also reported inadequate content and lack of relevant examples which forced them to always search for alternative materials. Lim, Park, & Kang (2016) points that rich and relevant content should always be incorporated in e-learning courses so as to boost academic self-efficacy.

Content Support

The students gave a good report concerning course announcements and reminders on their courses. This conforms to Wright (2014) guidelines on content support which stated that reminders and announcements helps online students to updated with the course issues. However, the students lamented about the inadequate use of multimedia and the infrequent feedbacks received from instructors. There is a need for multimedia use in e-learning courses as it improves learning by keeping the learners engaged

and motivated (Muuro et al., 2014). Furthermore, there is a need to improve content support through timely feedback and interaction with facilitators via emails, discussion forums, and collaborative activities, which is key in learner support (Queiros & de Villiers, 2016).

Social Support

The only source of social support for JKUAT e-learning students is through the online library according to this study. Otherwise, information support, affirmational support, and emotional support were reportedly not effective as the students stated that both LMS forum and chat were not active. Social support, which is commonly categorized into four types of supportive, informational, instrumental, and emotional support, is an important motivator that affects online students (Munich, 2014). This support comes primarily from sources such as such as, peers, forum, chat, and e-learning group work (Weng & Chung, 2015; Queiros & de Villiers, 2016). It is therefore imperative that JKUAT embraces LMS chats and forum in its courses in order to boost social support.

Administrative Support

The results of this study shows that the level of admin support namely: on-campus orientation, course registration, and academic advice, is satisfactory. The only problem the students complained about concerns communication using the telephone. They asserted that communication through telephone calls was a challenge as most calls went unanswered. This made it very difficult to get information regarding the course such as examination information or fee issues. This calls for a dedicated call center for addressing student's matters as recommended by Makokha and Mutisya (2016).

Course Assessment

The results revealed that most students agreed that the content taught was enough to undertake assessments. However, nearly half of the students felt that they deserved to get assignment and CAT papers back while the rest thought it did not matter as long as they passed the assessment. A small minority also complained about lost CAT grades and exam grades, forcing them to re-submit some papers. There were also some concerns about delayed examination results and the excessive number of assignments, although these came from a smaller group of students. Regarding examinations, JKUAT need to conform to the findings made by Chawinga (2016), who observed that universities should safeguard student's grades and also release end of semester examinations on time to avoid inconveniencing the learners.

Learner Characteristics

The results show that nearly half of the students have a passion for e-learning and also possess useful internet and computer experience. However, close to half of the students lamented lacking LMS training as well lack of motivation from instructors. Jung (2017) observed that learner motivation (intrinsic and extrinsic) is crucial to the learners' success in an online coursework environment. JKUAT needs to provide training as it is a way of imparting e-learning skills through training was necessary in order to improve quality (Arinto, 2016; Azawei et al., 2016).

Instructor Characteristics

The results show that instructors are not satisfied with training on LMS use and course development. They also expressed concerns about low motivation from the university and the lack or limited access to e-learning seminars and workshops where they can learn more about e-learning. JKUAT needs to provide training, motivation, and incentives in order to enhance instructor participation in e-learning (Makokha & Mutisya, 2016; Mayoka & Kyeyune, 2012; Kisanga, 2016).

Institutional Factors

The study further reveals that lack of funding has handicapped infrastructure implementation such as equipping labs with computers and maintaining the network that host the LMS. Poor network connectivity and Internet bandwidth has also hampered quality use. Tarus, Gichoya, and Muumbo (2015) observed that these technological components play a critical role in facilitating accessibility to e-learning by the users and should be adequate. There are also reports about lack of adequate training, lack of policy for developing, using and securing e-learning, lack of training in LMS and course development, and low motivation for the instructors and administrators. These results are consistent with Kashorda and Waema's (2014) and Bagarukayo and Kalema (2015) studies, which advocated for funding, policy, and infrastructure as key pillars for e-learning success.

Conclusion and Recommendations

The present study aimed to cast some light on major challenges that hinder quality application of e-learning in developing countries. A case was chosen from Kenya because e-learning has been recently implemented in nearly all public universities. Findings confirmed that there are about eight (8) quality issues that influence e-learning in Kenya and in other developing countries.

With the competitive expansion of e-learning in developing countries, HEIs that provide e-learning must improve the quality of their e-learning systems based on these factors in order to achieve successful adoption, implementation, and use of e-learning systems. The present study may contribute to a better understanding of Kenyan and developing countries e-learning systems by offering a criterion for enhancing the quality and may serve as useful benchmark for e-learning providers and policy makers.

In addition, it can be used to identify weak areas in e-learning systems operations from the users' point of view and suggest effective strategies for improving quality. The author also believes that the context of Kenya is a typical representation of many situations facing HEIs in developing countries and therefore the results can be applied to other developing countries.

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Appendix A

Data Collection Instruments

Students questionnaire.

This questionnaire is to be filled by E-learning students in JKUAT university in Kenya.

Correspondent Background:

Course Name: -----

Course Level: Master's degree [] First Degree [] Diploma []

Year of Study: Yr1 [] Yr2 [] Yr3 [] Yr4 [] Yr5 []

Gender: Male [] Female []

Mark using a pen against your preferred choice by a tick (✓) or a cross (x)

SD= strongly disagree; D= Disagree; N=Neutral; A=Agree;SA= strongly agree.

Section 1: Course design.

No	Issue	1 Strongly disagree	2 Disagree	3 Neutral	4 Agree	5 Strongly agree
Course design questions:						
a)	Our course id provided by Information about the duration, list of books, availability of instructor					
b)	Our course has an attractive and consistent layout improves quality(CD2)					
c)	Our course has Relevant, accurate, complete content aligned to objectives.					
d)	Our course has a well sequenced content neatly arranged in headings and sub headings					

On a scale of 1 to 5 (where 1=strongly disagree and 5 = strongly agree), please indicate your perception whether you agree or disagree with the statement: Our course is well designed through course information, course layout, and course structure and course organization.

Section 2: Content support.

No	Issue	1 Strongly disagree	2 Disagree	3 Neutral	4 Agree	5 Strongly agree
Content support questions::						
a)	Our course has Announcement & reminders					
b)	Our course uses multimedia objects					
c)	We get Constructive feedback from instructors					
d)	Our course content material are realistic					

On a scale of 1 to 5 (where 1=strongly disagree and 5 = strongly agree), please indicate your perception whether you agree or disagree with the statement: our content is well supported through announcements and reminders, use of multimedia, constructive feedback and authentic learning activities.

Section 3: Social support.

No	Issue	1 Strongly disagree	2 Disagree	3 Neutral	4 Agree	5 Strongly agree
Social support quality is improved through:						
a)	Our course has Information support from peers					
b)	Our course has Online library support (instrumental)					
c)	Our course has Emotional support from family & peers					
d)	Our course has Affirmational support from group work					

On a scale of 1 to 5 (where 1=strongly disagree and 5 = strongly agree), please indicate your perception whether you agree or disagree with the statement: our course is well supported socially through announcements and reminders, use of multimedia, constructive feedback and authentic learning activities.

Section 4: Administrative support.

No	Issue	1 Strongly disagree	2 Disagree	3 Neutral	4 Agree	5 Strongly agree
Administrative support questions:						
a)	Our course has registration support					
b)	Our course academic advice support					
c)	We are given orientation					
d)	Our university has a dedicated call center.					

On a scale of 1 to 5 (where 1=strongly disagree and 5 = strongly agree), please indicate your perception whether you agree or disagree with the statement: our course is well supported administratively through registration support, academic advice support, orientation and providing a dedicated call center.

Section 5: Course assessments.

No	Issue	1 Strongly disagree	2 Disagree	3 Neutral	4 Agree	5 Strongly agree
Course assessment quality is improved through:						
a)	Our course has clear assessment policies					
b)	Our course grades are well managed					
c)	Our course assignments are well managed					
d)	We receive feedback on time.					

On a scale of 1 to 5 (where 1=strongly disagree and 5 = strongly agree), please indicate your perception whether you agree or disagree with the statement: our course assessments are well administered through better assignment management, better grade management, timely feedback and clear assessment policies.

Section 6: Learner characteristics.

No	Issue	1 Strongly disagree	2 Disagree	3 Neutral	4 Agree	5 Strongly agree
Learner characteristics that improve quality are:						
a)	I have computer and internet experience					
b)	I am self-motivated to use e-learning					
c)	Our instructors motivate us in e-learning					
d)	We have learner-to-learner interactions in out courses					

On a scale of 1 to 5 (where 1=strongly disagree and 5 = strongly agree), please indicate your perception whether you agree or disagree with the statement: our learners have the following characteristics: computer and internet experience, intrinsic & extrinsic motivation and learner-learner interaction.

Instructor Questionnaire.

This questionnaire is to be filled by E-learning instructors in JKUAT university in Kenya

Correspondent Background:

Qualification: Master's degree [] Master's degree []

Gender: Male [] Female []

Mark using a pen against your preferred choice by a tick (✓) or a cross (x)

SD= strongly disagree; D= Disagree; N=Neutral; A=Agree;SA= strongly agree.

Section 1: Instructor characteristics.

No	Issue	1 Strongly disagree	2 Disagree	3 Neutral	4 Agree	5 Strongly agree
Instructor characteristics questions						
a)	We are given incentives for e-learning.					
b)	We are trained on LMS use.					
c)	We have been trained on course development.					
d)	We attend e-learning seminars & workshops.					

On a scale of 1 to 5 (where 1=strongly disagree and 5 = strongly agree), please indicate your perception whether you agree or disagree with the statement: an instructor characteristics for quality are provided through incentives, training, seminars and workshops.

Section 2: Institutional factors.

No	Issue	1 Strongly disagree	2 Disagree	3 Neutral	4 Agree	5 Strongly agree
Institutional factors questions						
a)	We have good infrastructure such as computers and high internet speeds					
b)	We have good e-learning policies.					

-
- c) We have an institutional culture that supports e-learning.
- d) Our e-learning system is sufficiently funded.
-

On a scale of 1 to 5 (where 1=strongly disagree and 5 = strongly agree), please indicate your perception whether you agree or disagree with the statement: Institutional Factors for quality are provided through funding, policies, infrastructure and culture.



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Evaluation of Online Video Usage and Learning Satisfaction: An Extension of the Technology Acceptance Model

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Abstract

The aim of the study was to examine the determining factors of students' video usage and their learning satisfaction relating to the supplementary application of educational videos, accessible in a Moodle environment in a Business Mathematics Course. The research model is based on the extension of *Technology Acceptance Model* (TAM), in which the core TAM constructs – perceived usefulness, perceived ease of use, attitude – and internet self-efficacy were included as the explanatory factors of video usage. As regards the determinants of learning satisfaction, beside the core TAM constructs, the role of learning performance, learner-learner interaction, and learner-teacher interaction was examined. Data were collected from 89 students using a questionnaire, on which the partial least-squares structural equation modelling approach was used to evaluate the research model. The results confirmed that perceived usefulness, attitude, and internet self-efficacy had a direct effect on the video usage. Learning satisfaction was directly influenced by learner-learner interaction, perceived ease of use, and learning performance. Furthermore, the results indicated that video usage had a significant effect both on learning performance and on learning satisfaction. The findings show that the extended TAM model can be applied for predicting the university students' video technology usage and their learning satisfaction regarding the usage.

Keywords: video usage, learning satisfaction, learning performance, technology acceptance model

Introduction

Thanks to the development of video technology and the Internet, as well as the development of multimedia reproduction devices, using video as a web-based multimedia device has become more and more widespread. Nowadays, several institutions offer online educational materials including video. Students can have rapid access to these materials anywhere and any time.

The numerous available technologies have lead to numerous possibilities for their use, therefore the way in which video technologies can be integrated into education is a serious question for both the management and the teachers. As a result it has become indispensable to evaluate the use of educational videos in different way.

To create successful strategies, it is essential to establish how to use instructional media in the most efficient way with the aim of enhancing learning (Koochang & Durante, 2003). For planning an efficient learner-centered electronic learning environment, apart from the cognitive factors, we must have a better understanding of the students' and behaviour as well as the factors influencing them (Abbad, Morris, & Nahlik, 2009; Giannakos, Chorianopoulos, & Chrisochoides, 2015; Grandon, Alshare, & Kwan, 2005; McConville & Lane, 2006). Therefore research into students' feelings and behaviour linked to video usage is needed. These investigations can provide the management with information that lays the foundation of decision-making (Al-Gahtani, 2016), which is essential because of the high production costs of educational videos (Donkor, 2010).

The aim of the present study was, on the one hand, to analyze the correlation of the factors influencing the university students' video usage and their learning satisfaction. On the other hand, with the help of the elaborated model, a theoretical framework is offered that could be suitable for assessing the video technology usage and the learning satisfaction of the university students. The results will contribute to the successful educational video usage for management and teachers alike.

The model used in the present study was based on the Technology Acceptance Model (TAM). The current research was carried out in a higher-level mathematics course at a College of Business located in Hungary. Besides traditional classroom teaching and electronic textbooks, the students had access to online educational videos available in a Moodle environment. The 10-15 minute long, problem-based educational videos had been recorded by the teachers and the step-by-step solution of each task was demonstrated on a split-screen display.

With Moodle, the students were able to communicate electronically with their group-mates and the teachers using forum participation and message sending.

Literature Review and Research Model

Videos in Education

The exclusive dominance of educational media such as speech and written textbooks lasting for many decades was overthrown by the appearance of visual and audiovisual media and by their integration into education in the twentieth century. There are more and more examples world-wide for using video technology in the area of organized training. The means of usage and the applied videos are varied. The selection of video type, for example, is influenced by the course content or the level of expenditure. However, Lonn-Teasley (2009) raise a serious question: How does video technology influence teaching and learning?

In the course of evaluation, examining the cognitive factors, such as learning performance, is of primary importance, but analysing the affective factors, such as learning satisfaction and the behaviour linked to it, is also important. (Noel-Levitz, 2011; Palmer & Koenig-Lewis, 2012).

The studies into learning performance don't show consistent results. Some researchers say video usage doesn't have a significant effect on learning performance or the effect is not clear (DeVaney, 2009; Figlio, Rush, & Yin, 2010; Kim & Chen, 2011). In contrast, several studies have shown that video usage

has a significant positive effect on learning performance (Dalal, 2014; Day & Foley, 2006; Dupuis, Coutu, & Laneuville, 2013; Kay & Kletschin, 2012; Kurtz, Fenwick Jr., & Ellsworth, 2007; Lloyd & Robertson, 2012; Traphagan, Kucsera, & Kishi, 2010; Vajoczka, Watt, Marquis, & Holshausen, 2010; Wieling & Hofman, 2010; Williams, Birch, & Hancock, 2012; Yunus et al., 2006; Zhang, Zhou, Briggs, & Nunamaker, 2006). No result supporting any negative effect is available.

Affective examinations into video usage have been published since 2006 (Chester, Buntine, Hammond, & Atkinson, 2011). These studies analyze student satisfaction, student attitude, or student behaviour. In descriptive attitude studies where students can use videos optionally along with live lectures, the researchers find that students have a positive attitude and they advise such courses supported by videos to fellow students (Copley, 2007; Dupagne, Millette, & Grinfeder, 2009; Hill & Nelson, 2011; Kelly, Lyng, McGrath, & Cannon, 2009; Williams, Birch, & Hancock, 2012). In the case of satisfaction studies unrelated to the means of usage, most of the students are satisfied (Soong, Chan, Cheers, & Hu, 2006; Gosper et al., 2007). There are comparative examinations as well in which researchers point out that the video enhances learning satisfaction compared both to traditional education (King & He, 2006; Schepers & Wetzels, 2007; El-Sayed & El-Sayed, 2013) and to traditional, video-free, text-based e-learning (Choi & Johnson, 2007).

The behaviour and attitude studies where students are provided with optional videos along with live lectures show that the students most frequently use the available videos (1) to make up the missed lectures (McElroy & Blount, 2006; Traphagan, Kucsera, & Kishi, 2010); (2) to supplement the live lectures (Evans, 2008; Lonn & Teasley, 2009; McElroy & Blount, 2006; Traphagan, Kucsera, & Kishi, 2010); and (3) to get specially prepared for an exam and to revise for an exam (Chester et al., 2011; Copley, 2007; Gosper et al., 2007; Laing & Wootton, 2007; Williams & Fardon, 2007).

The *Technology Acceptance Model* (TAM) introduced in the next chapter is used by the majority of correlation revealing studies.

Factors Influencing Video Usage – *Technology Acceptance Model*

The most widely-used model for the explanation of students' technology use is the *Technology Acceptance Model* (TAM) associated with the name of Fred Davis (1986).

According to the original model, the user attitude has a direct influence on the usage of a new information system, the aim of which is to measure the acceptance on the part of the system user. This attitude toward using is determined by another two variables: perceived usefulness and perceived ease of use. Perceived ease of use, beside its effect on attitude, has a direct effect on perceived usefulness as well. The relationships between TAM-constructs are shown in Figure 1.

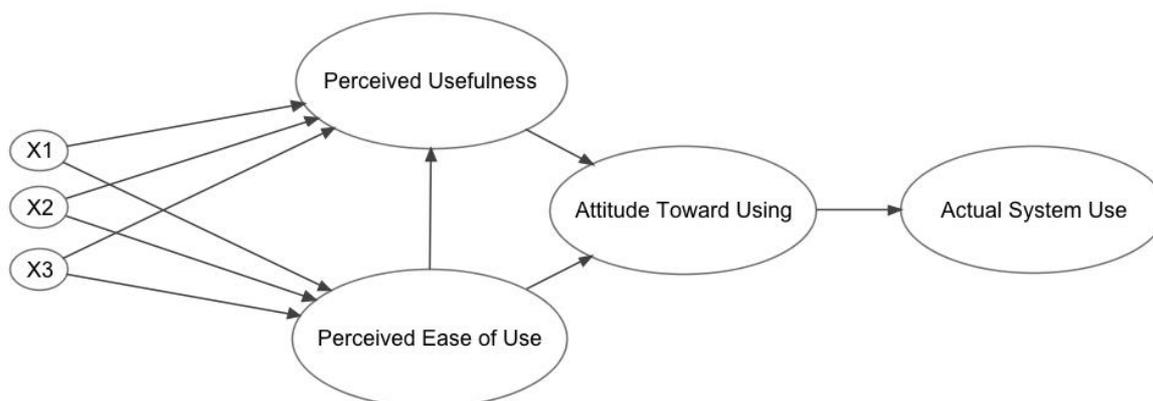


Figure 1. Correlation of original TAM factors. Reprinted from *A technology acceptance model for empirically testing new end-user information systems: Theory and results* (Doctoral dissertation), by Davis, 1986, Cambridge, MA: Sloan School of Management, Massachusetts Institute of Technology. Copyright 1986 by the Massachusetts Institute of Technology.

Both perceived usefulness and perceived ease of use have a direct effect on system use (Davis, Bagozzi, & Warshaw, 1989; Sumak, Hericko, & Pusnik, 2011; Venkatesh & Davis, 2000). The above-mentioned correlations of constructs and their role in the explanation of behaviour, have been confirmed in several further studies carried out on different samples in different settings. For example, Sumak et al. (2011) in their meta-analysis enlist only educational applications, which evaluate e-learning systems, environments, or technologies and tools. They come to the conclusion that the results are consistent.

In higher education, the TAM model is used mainly for learning management systems. The Moodle system analysis is the most frequent, to which several extended models have been worked out. In the course of extension, numerous external variables that fit into the given educational environment are used. The variables measure the characteristic features of the system such as perceived convenience (Hsu & Chang, 2013), lack of LMS availability (Alharbi & Drew, 2014), and technical support (Sanchez & Hueros, 2010), or they measure the users' characteristics and previous experience such as perceived playfulness (Padilla-Meléndez, Aguila-Obra, Garrido-Moreno, 2013); faculty type, academic year, GPA, skills on computer and internet, difficulty reading from computer screen, the number of previously e-learning courses (Majdalawi, Almarabeh, & Mohammad, 2014; Al-Assaf, Almarabeh, & Eddin, 2015), LMS usage experience (Alharbi & Drew, 2014), and computer self-efficacy (Sanchez & Hueros, 2010).

Not only external variables can be used for the extension of the TAM model. In the article written by Islam (2013), three outcome constructs (namely perceived learning assistance, perceived community building assistance, and perceived academic performance) are involved in the TAM model revealing the possible outcomes of the Moodle e-learning systems adoption and the use among university students.

Relatively few studies based on the TAM model with the aim of examining video technology acceptance are available. Using the TAM constructions Donkor (2011) estimated the students' acceptance satisfaction regarding video lessons used among students of distance education. Lee and Lehto (2013) identified the determinants of the YouTube behavioural intention with their model in the course of their study into procedural learning through YouTube in a lab setting. For this they used an extension of the TAM model where they took the user satisfaction mediator variable and YouTube self-efficacy,

vividness, content richness, task technology fit external variables into consideration beside the usual variables.

Based on the above-mentioned results, the following hypotheses have been set up in this research:

H1: Perceived ease of use has a significant positive effect on perceived usefulness.

H2: Perceived ease of use has a significant positive effect on attitude.

H3: Perceived usefulness has a significant positive effect on attitude.

H4: Attitude has a significant positive effect on video usage.

H5: Perceived usefulness has a significant positive effect on video usage.

H6: Perceived ease of use has a significant positive effect on video usage.

Furthermore, it was assumed that, based on the findings of DeLone and McLean (2003) and Islam (2013) a correlation between video usage and learning performance can be hypothesized, namely:

H7: Video usage has a significant positive effect on learning performance.

According to the claim of Davis and his colleagues (Davis et al., 1989; Venkatesh & Davis, 1996) when using the TAM it is important to take into consideration the external factors influencing perceived usefulness and perceived ease of use.

Including these factors in the study, special information can be obtained, apart from general correlations. Moreover, with their help, the explanatory power can be increased (Davis et al., 1989; Mathieson, 1991).

According to Abdullah and Ward's (2016) meta-analysis, self-efficacy is the most commonly used external factor in applications of the TAM in education. Self-efficacy is defined by Bandura (1997) as the belief "in one's capabilities to organize and execute the courses of action required to produce different attainments" (p. 3).

In the course of web-based learning, the student's self-efficacy can be interpreted as the ability to fulfil learning tasks with the help of the e-learning system or technology under consideration (Abbad, 2010). In such contexts e-learning, computer, and internet self-efficacy can be defined. The role of such self-efficacy constructs in defining the student's behaviour has been confirmed by several researchers through their direct influence on both perceived ease of use (Lee, Hsiao, & Purnomo, 2014; Liang & Tsai, 2008; Roca, Chiu, & Martinez, 2006) and perceived usefulness (Lee et al., 2014; Rezaei, Mohammadi, Asadi, & Kalanta, 2008).

Those students who have a higher level of self-efficacy for example in operating an e-learning system have a more positive perception of the ease of use of the given system and its usefulness and they are more willing to accept and use the system than their fellow-students who have a lower level of self-efficacy (Abbad, 2010).

In this study the role of students' internet self-efficacy is examined with regard to two hypotheses.

H8: Internet self-efficacy has a significant positive effect on perceived ease of use.

H9: Internet self-efficacy has a significant positive effect on perceived usefulness.

Factors Influencing Learning Satisfaction

Satisfaction in general is the feeling of difference between prior expectations and perceived achievement. Keller (1983) defines learning satisfaction as a student's overall positive assessment of his or her learning experience. Satisfaction can be measured only after the learning activity.

In the case of learning using e-learning systems or technology, the most important factors, which have a positive effect on learning satisfaction, are the learner's actual performance (Hui, Hu, Clark, Tam, & Milton, 2008; Liao, Palvia, & Chen, 2009) and perceived usefulness, perceived ease of use and attitude, which are also connected to the given e-learning system or technology, measurable also after the learning activity (Del Barrio, Romero-Frías, & Arquero, 2013; Hui et al., 2008; Lee & Lehto, 2013; Sun, Tsai, Finger, Chen, & Yeh, 2008). All of these are measurable only following the learning activity.

Consequently, with regard to video-based learning satisfaction, the following hypotheses were formulated:

H10: Learning performance has a significant positive effect on learning satisfaction.

H11: Perceived usefulness has a significant positive effect on learning satisfaction.

H12: Perceived ease of use has a significant positive effect on learning satisfaction.

H13: Attitude has a significant positive effect on learning satisfaction.

A further factor, identified by several researchers, (Abdous & Yen, 2010; Ali & Ahmad, 2011; Bray, Aoki, & Dlugosh, 2008; Lee, 2012; Sahin, 2007; Yukselturk & Yildirim, 2008) is interaction which is an important predictor of learning satisfaction in the course of web-based learning. Interaction is defined as verbal and non-verbal communication between players (Laurel, 1993). There are several types of interaction groupings, which are based on the type of players in them. The most widely-used system was developed by Moore (1989) for distance education and it contains three types of interaction groups: learner-teacher interaction, learner-learner interaction, and learner-content interaction.

In the course of web-based learning, students can exploit several interaction tools, for example instant message, e-mail, forum, discussion board, voice call, video call, voice conferencing, and video conferencing; all of which support interaction with other students and the teacher. Some of these tools can be found intergrated into e-learning systems, like Moodle.

If we examine the role of learner-teacher interaction and the role of learner-learner interaction in learning satisfaction separately, the results will be different. Some researchers claim that learner-teacher interaction has the greatest impact on learning satisfaction (Kuo, Walker, & Schroder, 2010; Kuo, Walker, Schroder, & Belland, 2014; Marks, Sibley, & Arbaugh, 2005; Sahin, 2007) others,

however, confirmed that learner-learner interaction has a greater effect on learning satisfaction (Jung et al., 2002; Rodriguez Robles, 2006).

The difference in findings can have several explanations. One of them is that different educational settings, such as different course requirements, need interactions of different levels (Kuo et al., 2010); the other is that interactive preferences may change depending on the type of student (Croxtton, 2014).

Based on the results of previous research, it is assumed in this study that interaction has a positive effect on satisfaction. From this it was hypothesized:

H14: Learner-teacher interaction has a significant positive effect on learning satisfaction.

H15: Learner-learner interaction has a significant positive effect on learning satisfaction.

Research Model

Based on the findings of previous research, we created a research model for the examination of hypotheses, shown in Figure 2. In this model video usage and video-based learning satisfaction are used as dependent variables.

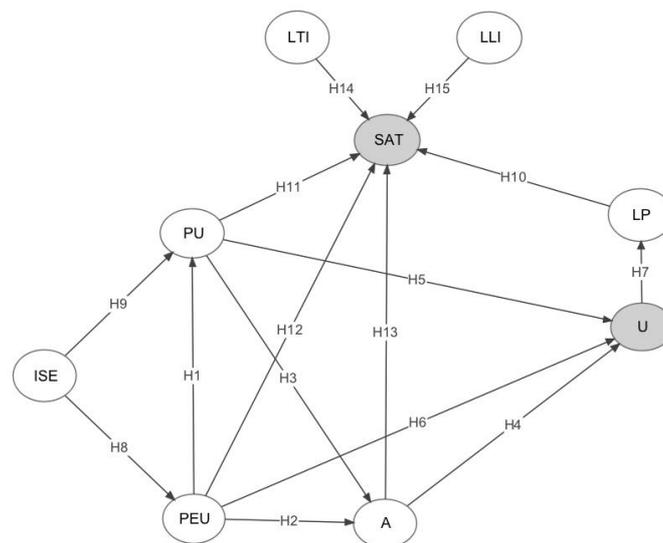


Figure 2. Research model.

*Note. PU = perceived usefulness; PEU = perceived ease of use; A = attitude; SAT = learning satisfaction; ISE = internet self-efficacy; LLI = learner-learner interaction; LTI = learner-teacher interaction; U = video usage; LP = learning performance

The definitions of the constructs used in the present research is summarized in Table 1.

Table 1

Construct Definitions

Construct	Definition	Source
PU	Perceived usefulness is defined as the degree to which the user thinks that using the video will enhance his or her performance.	(Davis, 1989)
PEU	Perceived ease of use is defined as the degree to which the user thinks that using the video will be free from effort.	(Davis, 1989)
A	Attitude towards using videos refers to the student's positive or negative feelings associated with video-based learning.	(Fishbein & Ajzen, 1975, as cited in Davis et al., 1989)
SAT	Learning satisfaction refers to the student's positive feelings toward video-based learning experience.	(Keller, 1983)
U	Video usage is defined as the overall amount of video usage estimated by the user.	(Sun, Bhattacharjee, & Ma, 2009)
ISE	Internet self-efficacy refers to the student's belief in his or her capabilities to organize and carry out internet activities, to achieve the desired learning performance.	(Eastin & LaRose, 2000)
LLI	Learner-learner interaction is a two-way mutual communication between students who exchange information, knowledge, thoughts and ideas.	(Moore & Kearsley, 1996, as cited in Kuo et al., 2014)
LTI	Learner-teacher interaction is a two-way communication between the course teacher and the students.	(Moore & Kearsley, 1996, as cited in Kuo et al., 2014)
LP	Learning performance is the student's result at the end of the surveyed course.	

Method

Questionnaire Development, Content Validity

For the collection of demographic and educational data multiple choice questions were used (4 items), out of which there were one numerical and three nominal-level variables (Table 2).

To ensure content validity, the measurement of the latent variables in the model under study was carried out using a reduced version of the scale employed in other research (26 items). As a result, for the measurement of the constructs, widely-used scales or their simplified variants were used. Some minor changes were made to the formulation so that the items fit into the inter-relation of the research (Appendix 1).

The Population Under Examination

One hundred and five students of Edutus College in Hungary registered for Business Mathematics between the Spring semester of the academic year 2013/2014 and the Spring semester of the academic

year 2014/2015. During the course, in addition to traditional classroom teaching, e-textbooks, and practicing exercises, the students had free access to online videos integrated into a Moodle environment. The usage of online videos was optional. The students themselves were allowed to decide to what extent they wanted to use the videos and to what extent they wanted to attend the face-to-face lessons. The students of the college have prior experience of online videos because in certain face-to-face lectures video recordings are made, which are accessible after recording without being edited.

The Moodle course contained 13 lessons in all. Every lesson started with a short textual introduction followed by one (occasionally more) videos thus the students had access to 18 videos in total. The average length of the videos was 8.99 minutes (with a variance of 3.51 minutes). The videos, recorded in advance, were problem-based, demonstrating the step-by-step solution of a certain task in a split-screen style. The videos were embedded in the Moodle course with the help of Eduplayer module in a playable but not downloadable form. For playing the videos, the use of the browser was enough.

The Moodle course served as a communication channel between the teacher and the students and between students and students (message, forum, chat). It also served as an information surface for the students. The students could check information about the course (for example, course content or attendance sheets), about the schedule of the semester (for example, course content divided into weeks or dates of exams), about technical information about the course (for example, the need of software or settings), about the points collected during the semester, and the end of term grades.

With the aim of motivation, the teacher regularly sent an email message to the students informing them about the course content delivered in the latest face-to-face lesson, where it can be found in the Moodle course, and the teacher's suggestions regarding the videos to be watched and the tasks to be completed at home.

The students' interactions were not expected (either with the teacher or with each other). The channels merely offered a possibility to discuss any problem regarding the course content and the technical aspects of the course.

Data Collection

Data collection was carried out in writing. The online questionnaire was compiled with the help of Google Survey. Questionnaires were sent out by e-mail to 105 students at the end of the academic year 2014/2015, on May 7th, 2015. The questionnaire was available until September 2015. A total of 89 students responded and there were no invalid responses; thus the sample size of 89 was adequate for evaluating the research model. The demographic information about the respondents is given in Table 2.

Table 2

Demographic Information

		Frequency	Relative frequency
Gender	Female	55	61.8
	Male	34	31.2
Course	Daytime	66	74.2
	Correspondence	23	25.8
Field of study	Business and Management	15	16.9
	Trade and Marketing	44	49.4
	International Business	17	19.1
	Tourism and Catering	13	14.6
Age		Avg = 26.85	SD = 4.63

Data Analysis

To evaluate the research model and to examine the hypotheses, structural equation modelling (SEM) using partial least squares (PLS) regression was used. The use of PLS path analysis (PLS-SEM) was justified by the low sample size (N=89) of the survey (Henseler, Ringle, & Sinkovics, 2009) as well as the fact that normality was not confirmed in every construct (Chin, 1998).

The analysis was carried out using the SmartPLS 3 program (Ringle, Wende, & Will, 2005). The model allows the simultaneous set up of factor analysis and path analysis. The results of factor analysis were used to examine the reliability and validity of the measurement model. The fit of the structural model was tested with t-tests and the help of bootstrapping (generating 5000 sub-samples and applying individual sign changes).

For the examination of construct reliability the Cronbach's alpha measurement of inner consistency with 0.7 limit was used as well as composite reliability (CR) also with 0.7 limit (Fornell & Larcker, 1981; Hair, Black, Babin, & Anderson, 2010). Table 3 shows that in the case of all constructs, both conditions are fulfilled and the scales are reliable.

Table 3

The Characteristics of Constructs and Indicators

Constructs	α	Items	Standardized factor loadings	CR	AVE
PU	0.758	PU1	0.756	0.862	0.676
		PU2	0.798		
		PU3	0.906		
PEU	0.713	PEU1	0.838	0.839	0.636
		PEU2	0.691		
		PEU3	0.853		
A	0.803	A1	0.788	0.885	0.720
		A2	0.823		
		A3	0.929		
SAT	0.823	SAT1	0.819	0.883	0.661
		SAT2	0.915		
		SAT3	0.900		
		SAT4	0.570		
ISE	0.712	ISE1	0.810	0.818	0.535
		ISE2	0.859		
		ISE3	0.587		
		ISE4	0.633		
LLI	0.797	LLI1	0.818	0.878	0.705
		LLI2	0.848		
		LLI3	0.853		
LTI	0.780	LTI1	0.726	0.856	0.599
		LTI2	0.861		
		LTI3	0.688		
		LTI4	0.810		
U	1.000	U	1.000	1.000	1.000
LP	1.000	LP	1.000	1.000	1.000

*Note.

1. PU = perceived usefulness; PEU = perceived ease of use; A = attitude; SAT = learning satisfaction; ISE = internet self-efficacy; LLI = learner-learner interaction; LTI = learner-teacher interaction; U = video usage; LP = learning performance

2. α = Cronbach's alpha; CR = composite reliability; AVE = average variance extracted.

Based on the classification of Henseler et al. (2009), content validity, convergent validity, and discriminant validity are examined in this study. Content validity was guaranteed in this research by taking the indicators from previous research in the field of education as mentioned earlier. The assessment of convergent validity was carried out with the help of average variance extracted (AVE) based on the 0.5 criterion value, suggested by (Fornell & Larcker, 1981). Table 3 shows that the AVE value of each construct is above 0.5, thus the condition of convergent validity are fulfilled. Discriminant validity was proved in this study with the help of correlation matrix and the AVE values (Table 4) based on Fornell and Larcker (1981) criterion. Since, in the case of all variables, the square root of AVE values is greater than the off-diagonal values, discriminant validity between variables is satisfactory (Fornell & Larcker, 1981).

Table 4

Construct Correlations and the Square Root of AVE Values

Construct	PU	PEU	A	SAT	ISE	LLI	LTI	U	LP
Perceived usefulness (PU)	0.822								
Perceived ease of use (PEU)	0.618	0.798							
Attitude (A)	0.592	0.704	0.848						
Learning satisfaction (SAT)	0.517	0.587	0.558	0.813					
Internet self-efficacy (ISE)	0.480	0.531	0.456	0.266	0.731				
Learner-learner interaction (LLI)	0.392	0.412	0.353	0.539	0.063	0.840			
Learner-teacher interaction (LTI)	0.419	0.321	0.335	0.693	0.202	0.494	0.774		
Video usage (U)	0.562	0.550	0.650	0.440	0.446	0.336	0.251	1.000	
Learning performance (LP)	0.062	0.127	0.226	0.359	-0.081	0.228	0.125	0.250	1.000

*Note. In the correlation matrix the square root of average variance extracted (AVE) values presented diagonally.

Results and Discussion

The model obtained as a result of the PLS path analysis is shown in Figure 3, on which are displayed the path coefficients, their significance tests (the bootstrapping results) and the multiple determination coefficients (R^2).

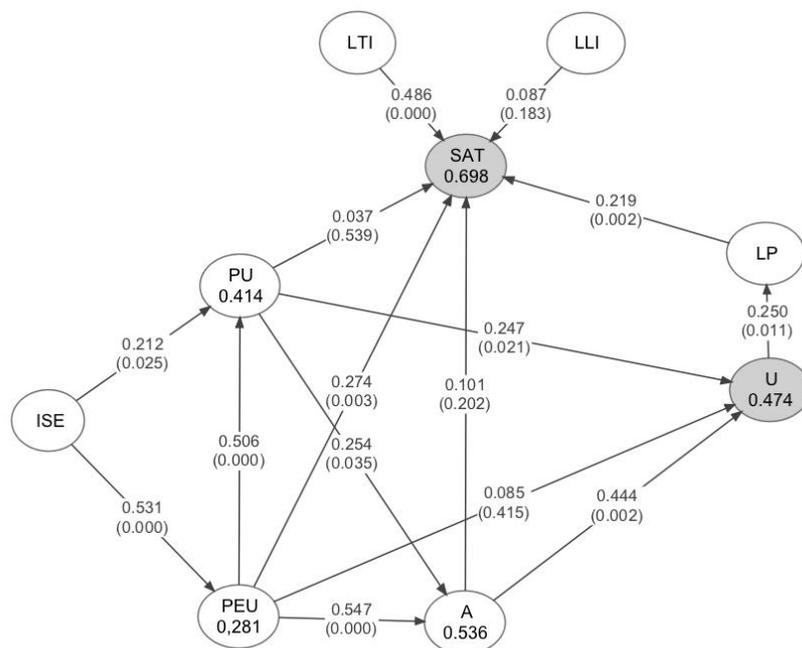


Figure 3. The results of partial least squares regression.

*Notes. 1. The explained variance (R^2) is shown in the circles, path coefficient on arrows, bootstrap results in brackets. 2. PU = perceived usefulness; PEU = perceived ease of use; A = attitude; SAT = learning satisfaction; ISE = internet self-efficacy; LLI = learner-learner interaction; LTI = learner-teacher interaction; U = video usage; LP = learning performance

In hypotheses H1-H6, the core TAM constructs influencing video usage are perceived usefulness, perceived ease of use, and attitude. The inter-relation of perceived usefulness, perceived ease of use, and attitude was also hypothesized. The results confirmed the significant positive effect of perceived usefulness (H5, $\beta=0.247$; $p=0.021$) and the significant positive effect of attitude (H4, $\beta=0.444$; $p=0.002$) on video usage.

The direct effect of perceived ease of use on video usage was not significant (H6, $\beta=0.085$; $p=0.415$). It is characteristic of such models in which measurement was taken after usage and not before it (van Raaij & Schepers, 2008; Venkatesh, Morris, Davis, & Davis, 2003).

Further direct interactions between TAM-variables in accordance with other TAM results all proved significant. Perceived ease of use has a direct positive effect on perceived usefulness (H1, $\beta=0.506$; $p<0.001$), perceived ease of use has a direct positive effect on attitude (H2, $\beta=0.547$; $p<0.001$), and perceived usefulness has a direct positive effect on attitude (H3, $\beta=0.254$; $p=0.035$).

Based on the above-mentioned results hypotheses H1-H5 have been accepted, hypothesis H6, however, has been rejected.

The model role of internet self-efficacy was formulated in the form of two hypotheses. The results harmonize with those of other researchers (Lee et al., 2014; Liang & Tsai, 2008; Rezaei et al., 2008;

Roca et al., 2006) according to which internet self-efficacy has a direct significant positive effect on perceived ease of use (H8, $\beta=0.531$; $p<0.001$) as well as on perceived usefulness (H9, $\beta=0.212$; $p=0.025$). Based on this, hypotheses H8-H9 were accepted. From the results it can be concluded that internet self-efficacy has a significant indirect effect on students' attitude (0.412; $p<0.001$) and on video usage (0.347; $p<0.001$) as well.

Using the extended TAM model mentioned above, 47.4% of video usage variance was successfully explained. This explanatory power of the extended TAM model is consistent with previous studies. It is considered that TAM consistently explains about 34%–52% of the variance in usage intentions (in case of a specific system) (Venkatesh & Davis, 2000).

The relation of video usage and learning satisfaction was predicted through a mediator variable: namely learning performance. The findings supported the prediction that video usage has a direct, significant positive effect on learning performance (H7, $\beta=0.250$; $p=0.011$) and that learning performance has a direct positive effect on learning satisfaction (H10, $\beta=0.219$; $p=0.002$). Furthermore, the research provided evidence that video usage also has an indirect positive effect on learning satisfaction (0.055; $p=0.044$).

From among further hypothesized explanatory variables (perceived ease of use, perceived usefulness, attitude, learner-teacher interaction, learner-learner interaction) learner-teacher interaction has a stronger positive direct effect (H14, $\beta=0.486$; $p<0.001$) on learning performance, while perceived ease of use has a weaker positive direct effect on it (H12, $\beta=0.247$; $p=0.003$). The direct positive effect of perceived usefulness (H11, $\beta=0.037$; $p=0.539$), attitude (H13, $\beta=0.101$; $p=0.202$), and learner-learner interaction (H15, $\beta=0.087$; $p=0.183$) was not significant.

With regard to learning satisfaction we succeeded in reaching a 69.8% explained variance, with the help of the examined explanatory variables. In addition to this the model confirmed further important indirect connections, which were not predicted in the hypotheses.

Factors influencing video usage can have an indirect effect, both on learning performance and learning satisfaction. In the research we could also demonstrate that perceived ease of use (0.128; $p=0.034$) and perceived usefulness (0.090; $p=0.034$) have an indirect significant positive effect on learning performance. The effect of attitude on learning performance was not significant (0.111; $p=0.066$).

In accordance with earlier studies (Liu, 2008; Shi, Chen, & Tian, 2011; Tsai & Tsai, 2003; Kuo et al., 2014; Womble, 2007), this study confirms that internet self-efficacy has an indirect positive effect on learning performance (0.087; $p=0.030$) and learning satisfaction (0.233; $p=0.001$).

The indirect effects between constructs as well as their significance are shown in Table 5.

Table 5

Indirect Effects Between Constructs

Relationships	Indirect effect	<i>p</i>
ISE-A	0.412	0.000
ISE-LP	0.087	0.030
ISE-SAT	0.223	0.001
ISE-U	0.347	0.000
PEU-LP	0.128	0.034
PU-LP	0.090	0.034
U-SAT	0.055	0.044

**Note.* PU = perceived usefulness; PEU = perceived ease of use; A = attitude; SAT = learning satisfaction; ISE = internet self-efficacy; LLI = learner-learner interaction; LTI = learner-teacher interaction; U = video usage; LP = learning performance.

Conclusion and Implications

The TAM model was extended in the study with the aim of analysing the university students' video usage and the correlations of the factors influencing learning satisfaction relating to the usage. The model provides a useful theoretical basis for understanding the Edutus College students' video usage and learning satisfaction. The findings assist the college leadership and teachers in successful application of educational video.

Furthermore the model, which was validated in the college environment, ensures an integrated theoretical framework which can be used to estimate the university students' usage of video technology and the learning satisfaction connected with the usage, whether it be within the framework of traditional education or of distance learning.

The results of the study have several consequences for further research and practical application. The data to a certain extent support the existence of the basic TAM correlations in a Hungarian college of business studies, thus confirming the robustness and explanatory power of TAM for the use of technology in a higher education setting.

Perceived usefulness and attitude exert the strongest influence on video usage; therefore it is advisable to take measures that could reinforce the positive opinion of students' video usage.

Perceived ease of use did not have a significant direct effect on video usage. The logical explanation for this could be that video usage for educational purposes, accessible online, proves to be easy. Another reasonable explanation could be that students tend to overcome the difficulties of video usage to achieve better results in their studies.

Internet self-efficacy significantly influences video usage, learning performance, and learning satisfaction. It is therefore essential to assess self-efficacy and to use suitable methods for increasing the students' internet self-efficacy. They can be embedded in education if needed.

Learner-teacher interaction had a significant effect on learning satisfaction, while the effect of learner-learner interaction on learning satisfaction was not significant. The possible explanation of the latter correlation on the one hand is that in the type of course learner-learner interaction was not expected, in other words group work was not used. On the other hand the study did not take the quality of interactions and their goal into account. As a result we were not familiar with the type of interaction among students.

Learner-teacher interaction can be inspired via the teacher's intervention and initiative. It could equally be important to guarantee further possibilities for interaction in a Moodle environment, since the intensity of interaction can considerably be influenced by the quantity and quality of communication channels offered by LMS.

Limitations and Future Work

As in every study some limitations should be mentioned in this study as well, a part of which could inspire further research. Firstly, the restrictions are attributed to the application of self-admission measurement, as a result the data obtained were not objective for the examination of the model. Therefore, further research should be carried out in the future in which it would be advisable to combine the video usage data based on self-confession with the data of online students' activities derived from the diary file of the web server.

Secondly, since the research was carried out in a given course of a college, in a given education setting, we should be careful when generalizing the results. It is also advisable to use the model in the future for analysing further courses in other fields of science and offered by other universities.

Thirdly, every effort should be made to increase the explained variance: by increasing Cronbach's alpha, the number of items in each scale, then performing an item analysis to get the highest possible alpha; by increasing the sample size and by making sure that the sample is adequately homogeneous, for which the examination analysis of different individual factors (such as socio-economic background knowledge of ICT and motivational factors) as moderator variables is suggested, using multi-group analysis methods.

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Appendix 1

Constructs and Their Indicators

Construct	Indicators (Items)	Source
Perceived usefulness PU	PU1: Using videos makes my learning easier. PU2: Videos support critical aspects of the learning material. PU3: Using videos enhances my effectiveness of learning.	(Davis, 1989)
Perceived ease of use PEU	PEU1: Interacting with the videos doesn't require a lot of mental effort. PEU2: Overall, I find the videos easy to use. PEU3: I find the videos flexible to interact with.	(Davis, 1989)
Attitude A	All things considered my using the videos in learning is A1: good. A2: pleasant. A3: favourable.	(Fishbein & Ajzen, 1975, as cited in Davis et al., 1989)
Learning satisfaction SAT	SAT1: I am satisfied with my learning from the videos. SAT2: I find the videos to be effective in meeting the learning objectives. SAT3: The videos have contributed greatly to my acquisition of relevant skills. SAT4: The videos make me spend more time studying.	(Donkor, 2011)
Internet self-efficacy ISE	ISE1: I understand terms/words relating to the Internet. ISE2: I am confident in learning advanced skills within a specific Internet program. ISE3: I turn to an online discussion group when help is needed. ISE4: I can explain why a task will not run on the Internet.	(Eastin & LaRose, 2000, as cited in Kuo et al., 2014)
Learner-learner interaction LLI	LLI1: Overall, I had numerous interactions related to the course content with fellow students. LLI2: I communicated with my fellow students about the course content through different communication tools. LLI3: I got lots of feedback from my fellow students.	(Kuo et al., 2014)
Learner-teacher interaction LTI	LTI1: I had numerous interactions with the instructor during the semester. LTI2: I received enough feedback from my instructor when needed. LTI3: I asked the instructor my questions using different communication tools. LTI4: The instructor replied my questions in time.	(Kuo et al., 2014)
Directly measurable variables		
Video usage U	U: How often did you use the videos? Possible answers ranged from "not at all" (1) to "daily or more often" (5).	(Venkatesh, Thong, & Xu, 2012)
Learning performance LP	OUT: Your end-of-term grade: Answers (from 1 to 5) were arranged to be the same as the student's end-of-term grade.*	(Zhao, Lu, Huang, & Wang, 2010)
*In Hungarian education a 5-grade marking system is used, in which 1 is the worst and 5 is the best.		



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The Influence of National Culture on Educational Videos: The Case of MOOCs

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Abstract

This paper discusses the influence of cultural dimensions on Massive Open Online Course (MOOC) introductory videos. The study examined the introductory videos produced by three universities on Coursera platforms using communication theory and Hofstede's cultural dimensions. The results show that introductory videos in MOOCs are influenced by the national culture of the country in which the university is based. Based on this finding, this paper raises interesting questions about the effect of these cultural elements on potential learners from different countries and cultures around the world. The paper also makes suggestions about introductory video production in MOOCs.

Keywords: MOOCs, cultural dimensions, introductory videos, potential learners

Introduction

The influence of Massive Open Online Courses (MOOCs) on educational discourse is no longer questionable (Kim, 2015). MOOCs have been presented as revolutionary and seen as an opportunity to rethink education and learning in the information age (Krause & Lowe, 2014; Waks, 2016). As a result, a growing number of institutions worldwide are developing and offering MOOCs (Margaryan, Bianco, & Littlejohn, 2015). Provided through diverse platforms (Milligan, Littlejohn, & Margaryan, 2013), MOOCs give students from around the world an opportunity to obtain free education from renowned institutions they would not have access to otherwise (Ho et al., 2014; Perna et al., 2014; Koller, Ng, Chuong, & Chen, 2013). Interestingly, the openness and free nature of MOOCs attract learners with different educational, socioeconomic, and cultural backgrounds (Baggaley, 2013; Bayeck, 2016).

Interestingly, some researchers have focused on the demographic and motivation of MOOC learners, (Bayeck, 2016; Liyanagunawardena, Lundqvist, & Williams, 2015), while others have discussed team formation and management in MOOCs (Sanz-Martinez et al., 2015), single-gender group formation in MOOCs (Bayeck, Hristova, Jablokow, & Bonafini, 2016), and the design quality of MOOCs (Margaryan, Bianco, & Littlejohn, 2015). Yet, little is known on culture and its influence on the design of MOOCs. Moreover, research shows that adjusting the design and development of e-learning environments to

specific cultures ensures the success and adoption of e-learning in different cultural settings by different learners (Olaniran, Rodriguez, & Williams, 2010).

Addressing the urgent need to understand the effects of culture on online learning, Wang and Reeves (2007) explain that the heterogeneous population of learners in online education, calls for designers to find ways to accommodate learners from different cultural backgrounds. MOOCs reach a geographically and culturally diverse population (Bayeck et al., 2016; Liyanagunawardena et al., 2015), and as a new form of online education, MOOCs are cultural artifacts that are prone to be influenced by the cultural values of their developers (Dunn & Marinetti, 2007; Edmundson, 2007). As Masoumi and Lindström (2010) point out, technologies are not “passive structures” (p.80); they reflect values and beliefs in the ways they are employed. Thus, it can be assumed that culture and values are reflected in MOOCs. Understanding cultural expressions in e-learning environments becomes therefore critical because culture is the filter through which learners process and make meaning of information (Masoumi & Lindström, 2010; Olaniran et al., 2010). In addition, research investigating cultural aspects of e-learning settings argues for a “culture-centered design and development” for better learning outcomes and meaningful learning experiences for all learners (Olaniran et al., 2010, p. 449).

Still, to be able to design culturally-sensitive environments, one needs to examine what and how cultural aspects are embedded in current e-learning settings such as MOOCs (Masoumi & Lindström, 2010). Despite the popularity of e-learning and the consensus over the importance of culture in learning (Masoumi & Lindström, 2010), there is limited research addressing culture in e-learning settings (Olaniran, 2009; Olaniran et al., 2010), and particularly culture in MOOCs. Given the diversity of MOOC learners (Bayeck, 2016), insights into the cultural aspects of MOOCs is important to best serve learners. Indeed, literature shows that cultural factors impact learning, choice of images/icons, message structure, and interpretation in online learning environments (Olaniran et al., 2010). Communication approaches, and even the ways of structuring physical artifacts are affected by culture (Olaniran, 2009; Olaniran et al., 2010). For instance, images and icons have cultural meanings, and identifying cultural expressions in MOOCs could help make sense of the explicit and implicit messages in MOOCs, and help match the learning content to the learning needs of MOOC learners (Olaniran et al., 2010). To examine culture in MOOCs, this study intends to explore the influence of culture on introductory videos of institutions from three countries using Hofstede’s (2001) cultural dimensions.

This paper focuses on introductory videos produced by one university from three countries France, the United States, and South Korea on Coursera platform. Using three of Hofstede’s (2001) cultural dimensions, the following questions will be addressed in this study:

1. Do features in the video reflect each country’s culture?
2. To what extent are Hofstede’s dimensions of Power Distance, Individualistic/Collective, and Masculinity/Femininity culture reflected in the introductory videos produced by French, American, and South Korean institutions?

Why Introductory Videos

As movie trailers, we argue that Coursera's introductory videos help to promote and attract learners (Mihaescu & Vasiu, 2014). And as such, the introductory videos influence the potential learner's decision to either join or ignore the course. For this reason, we focus on the introductory videos because we assume that the cultural values of each country will be integrated in these short videos as a means to attract/interest learners.

Theoretical Perspective

This study draws on the work of Hofstede (1997) who defined culture as "the collective programming of the mind" (p.4). Culture in Hofstede's (1980) view can differentiate one group from the other. His extensive research suggested that culture may be differentiated through five main (Table 1) cultural dimensions (Hofstede, 1980; Hofstede, 2001). These cultural dimensions unveil mental gap among dissimilar countries (Hofstede, 1997). The cultural dimensions were identified based on Hofstede's (1980) survey of IBM staff from 72 countries.

At the heart of Hofstede's (1980) cultural dimensions is the understanding that values and orientations differ from one culture to another, and these differences may affect communication, interactions, learning, and the understanding/processing of visual graphics/images or messages (Hedberg & Brown, 2002; Olaniran, 2007; Olaniran et al., 2010; Swierczek & Bechter, 2010). Literature has established a relationship between Hofstede's (1980) cultural dimensions and the design of e-learning environments (Hammer, Janson, & Leimeister, 2014; Olaniran et al., 2010). For example, in a comparative study of Chinese and German e-learners, Hammer et al. (2014) found that adding bright and striking colors, centrally aligning text and graphics, and including "nice scenarios" as well as "nature-related pictures" (p.115) in the learning content were critical to increase the user friendliness of the environment for Chinese learners. Whereas, German learners preferred a clean and "clearly structured design with simple pastel colors" (Hammer et al., 2014, p. 115). This indicates that graphics and images may make a difference in the online learning experience of individuals from different cultural backgrounds.

As previously stated, there is less research on culture and online learning environments (Olaniran et al., 2010). Yet, more studies on web design and Internet use explore culture and how it influences the design and use of websites by consumers (Swierczek & Bechter, 2010) through Hofstede's (1980) dimensions. Bansal and Zahedi (2006) in their study of cultural contents in website images, found that images on 136 websites of seven countries (Great Britain (UK), Sweden, Costa Rica, Yugoslavia, Mexico, USA, Japan) had strong cultural contents. Images non-verbally communicate subtle messages, and the authors argue that when the "cultural contents of web image(s) [fit] the culture of the web visitor" the impact of the website increases (Bansal & Zahedi, 2006, p. 1284). Bansal and Zahedi (2006) conclude that understanding the cultural messages hidden in website images can help design website that are more consistent with the website users' culture and the intended message of websites. The findings of this research, which are appropriate for this study because of their focus on design, reveal that images can be misunderstood by individuals from by individuals from different cultures (Swierczek & Bechter, 2010). For this reason, this study explores culture in MOOCs through the lenses of Hofstede's (1980) cultural dimensions. Moreover, Hofstede's (1980) cultural dimensions have been used to enhance cross-cultural

communication, and to develop culturally-sensitive web interfaces (Marcus & Gould, 2000). It is then appropriate to look at culture in MOOCs through Hofstede's (1980) dimensions not only because it they have been related to e-learning, but also because they have been widely used to identify cultural features in different virtual environments (Olaniran, 2007; Olaniran et al., 2010).

Hedberg and Brown (2002) state that communication and even visual communication is difficult in the absence of "shared meaning" (p.23). In other words, visual communication as it is the case of MOOC introductory videos, is challenging because each MOOC learner uses his/her culture to make sense of what is presented in the introductory videos. Research in visual communication also reports that images and background have different meanings or produce different messages in different cultures (Scherer, 2010). Discussing the different ways information is created in the technology-rich society (e.g., videos, television, computer, web images), Lester (2013) explains that "visual images can stimulate both intellectual and emotional responses; they are powerful tools that persuade people to buy a particular product, think a specific way, or learn from a detailed story" (p.13). Thus, introductory videos produced by institutions likely are powerful tools that can motivate learners to enroll into a specific course. Therefore, from a visual communication perspective, examining the content, images, or message of MOOC introductory videos is relevant for videos that are targeting learners around the world and from different cultures.

For the purpose of this study, three of Hofstede's five cultural dimensions, developed in the 1980 and refined in 2001, are used as the foundation for examining cultural features in MOOC introductory videos. Power distance, individualism/collectivism, and masculinity/femininity are the three cultural dimensions examined in this paper.

Table 1

Summary of Hofstede's Cultural Dimensions Employed in This Study

Dimension	Description
Power distance	Attitude of a culture towards inequalities. High power distance cultures accept unequal distribution of power in the society while low power distance cultures strive for equality.
Individualism-collectivism	Individualistic cultures focus on the interests of the individual and his/her direct family. Collectivist cultures emphasize the community and group dependency and loyalty is paramount.
Masculinity-femininity	Masculine cultures are driven by competition, success, and achievement. Feminine cultures value qualities of life, close relationships, and care for others.

Methods

This small case study used purposive sampling to select the introductory videos to analyze. The researchers' cultural backgrounds and experience with French, South Korean, and American culture motivated the selection of the videos. A content analysis of the videos was conducted to explore the extent to which cultural dimensions are reflected in videos created for MOOCs. Since the existing research on culture in e-learning environments does not include videos, nor does it use content analysis, we adopted Bansal and Zahedi's (2006) approach to the study of cultural elements of website images, and were informed by content analysis in video game research (Wohn, 2011). Though Bansal and Zahedi (2006) analyzed websites and users across cultures, they developed a coding scheme we adopted to explore cultural dimensions in MOOC introductory videos (cf. Appendix A). Indeed, Bansal and Zahedi (2006) list signifiers/features of power distance, individualism/collectivism, and masculinity/femininity (cf. Appendix A) that guided our content analysis as we look for specific features to address our research questions.

Introductory Videos Sample

Three introductory videos respectively from the United States, South Korea, and France were selected to compare differences among these countries (Table 2). The three universities were ranked within the 100 world top universities in engineering and science fields in 2015 by the World University Ranking (Thomson Reuters, 2015). The ranking of these institutions provides a structural equivalence (i.e., objects that occupy the same position within a structural system) which allows for comparisons (Nowak, 1977). In addition, all these institutions focus on Science, Technology, Engineering, and Math (STEM), and all videos were under three minutes in length and discussed STEM related content. Our selection was also motivated by the researcher's understanding of the languages spoken or cultures in the respective countries (i.e., South Korea, France, and the United States).

Table 2

Cultural Dimensions of Selected Countries According to Hofstede's Dimensions

Country	Power distance index (PDI)	Individualism(IDV)	Masculinity/Femininity
France	High	High	Femininity
South Korea	High	Low	Femininity
U.S.	Low	High	Masculinity

Inter-Coder Reliability

The sample of three introductory videos from three institutions were coded by two female coders of differing cultural and educational backgrounds. Prior to coding the sample, the coders viewed and coded a pilot video and discussed the coding scheme in details. The videos were then coded independently, and

about 33% of the sample (three videos) was used to test inter-coder reliability using Cohen Kappa. For most of the variables, the reliability reached 1.000, except for one variable related to the form of dressing variable (.876).

Findings

Power Distance

Our findings show that the videos produced by these institutions have strong cultural features. Using the code scheme developed by Bansal and Zahedi (2006), we identified elements of culture that align with Hofstede's (2001) description of each country. Features of high power distance (HPD) are reflected in French and Korean videos as focusing camera on one person, dressing professional attire, and posing in formal manner (Bansal & Zahedi, 2006), while the U.S. displays characteristics of low power distance (LPD) by placing the authority figure in the background, having casual attire (in one video), and lighting the artificial stage dimly.

Interestingly, all videos, as shown in Figure 1, reveal features of HPD: the focus on one individual, professional dress code, and formal pose. We assumed that the contextual element of academia, that pursue professional attire to give more credibility (Lightstone, Francis, & Kocum, 2011) have influence on the presence of HPD features. Although we could find elements of HPD in all videos, instructors from HPD countries tend to display stronger authoritative attitudes through their fixed looks, facial expressions, and gestures depicting power.

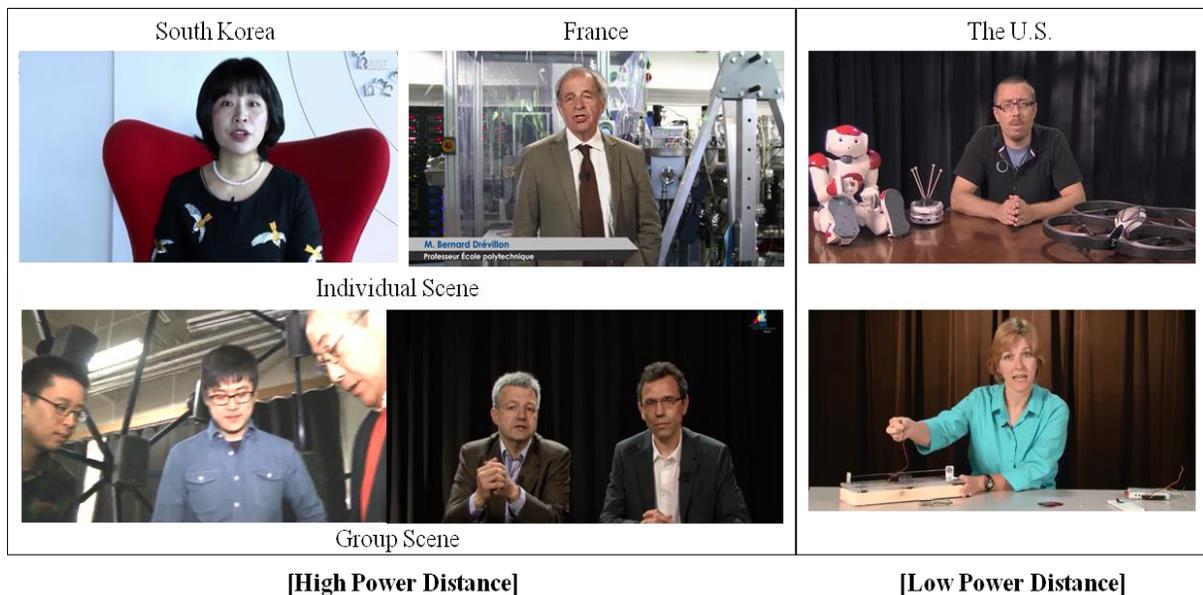


Figure 1. Example of high power distance and low power distance.

Individualism and Collectivism

With regard to individualism and collectivism, in Figure 2, we found characteristics of individualism (IDV) in French and the U.S. videos while discovering features of collectivism (CVI) in Korean videos.

Although, the American and French videos demonstrate individualism (IDV), it was shown in different ways. For example, the American videos show a single instructor, while French videos display two instructors. Yet, even when two people come up, they communicate rarely and camera focuses only one. With regards to CVI, Korean videos also go along with Hofstede's (2001) description of the country. Videos often depict group of people gazing in the same direction, and interacting together. Especially, Korean video merges these features of CVI with HPD by focusing on an instructor among students (e.g., Korean video). Non-human objects appear in multiple such as multiple leaves, fruits, logos, and funny objects.

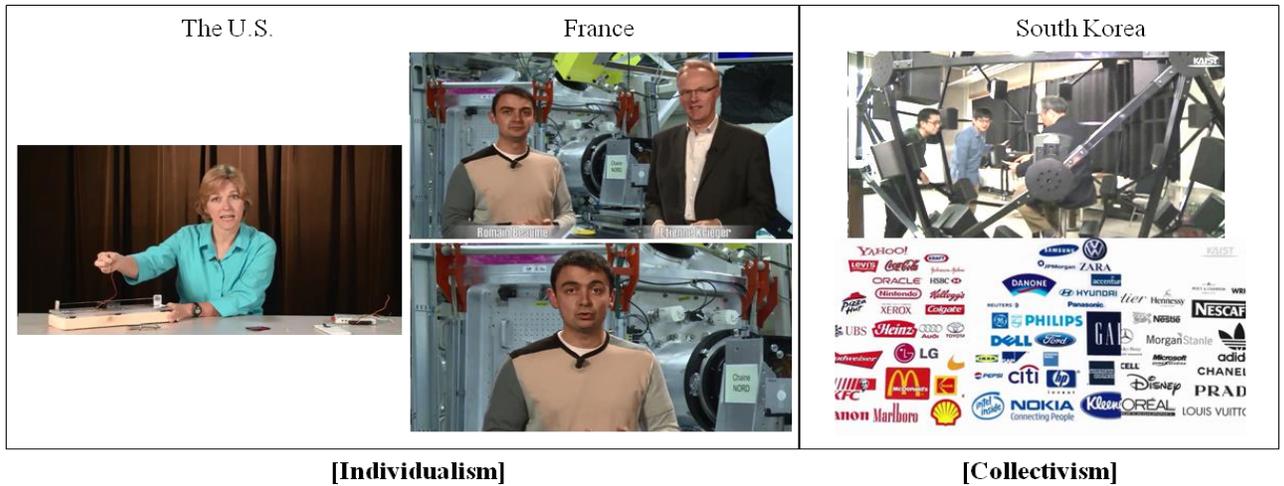


Figure 2. Examples of individualism and collectivism.

Masculinity and Femininity

We discovered that the U.S. videos exhibit aspects of masculinity while Korean and French video show more of feminine characteristics (Figure 3). Our results demonstrate that American videos display masculinity by showing frequent non-smiling faces and disposing more black and somber color in background. On the other hand, Korean and French videos depict feminine components by smiling frequently, arranging bright colors, and placing natural environment such as flowers and natural landscape.

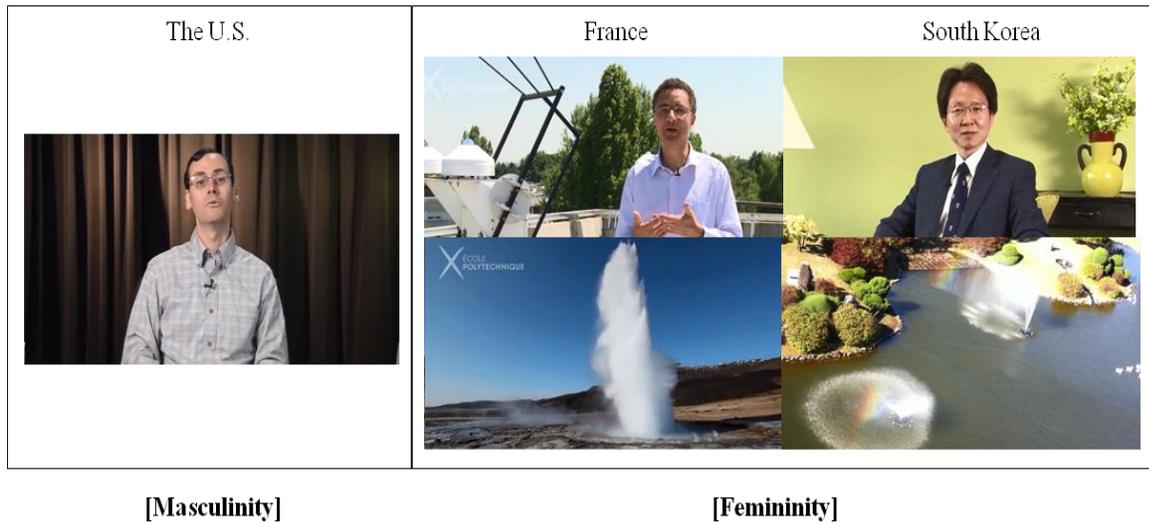


Figure 3. Examples of masculinity and femininity.

Discussion

Overall, our analysis indicates that national cultures affect video production. One exception is found in the American videos. Although the U.S. categorized in the LPD country, its videos display features in HPD such as formal postures or dressing. We hypothesized that this may be due to the established academic culture and norm to endow credibility to students (Lightstone, Francis, & Kocum, 2011). This also shows that educational videos are certainly cultural artifacts, and MOOCs introductory videos are not an exception. MOOC providers are traditional institutions and the fact that MOOCs are free, and open to all does not mean that the content itself (e.g., introductory videos) is free from providers' culture. However, developing MOOCs that reflect a country's culture, may negatively impact the learner's experience. Building on previous research on culture and its effect on learning, we argue that a mismatch between the learners' culture and the culture reflected in MOOCs videos, can create a gap in the learner's understanding of the video material. Culture being a "mental programming" (Hofstede, 2001 p. 4), aligning the video content with the learner's culture is certainly important to ensure that the overall message of the video is understood by the MOOC learner. Although this study is limited to introductory videos, it does give insights into the effect of culture on MOOCs, particularly MOOC videos.

To meet the targeted audience, MOOC developers/providers may need to customize course contents to accommodate the needs of learners from different cultures. Our argument is based on the work of researchers such as McCombs (2000) and Olaniran et al. (2010). The challenge in online and distance learning is to design course content that supports and values diverse learners and learning content (McCombs, 2000). MOOCs as a new form of e-learning certainly face the same challenge (Diver &

Martinez, 2015). Consequently, the idea of MOOCs providing education to “everybody and everywhere” (Clarke, 2013) is challenged (Jones et al., 2014) when we acknowledge that culture influences the adoption and use of technology (Olaniran et al., 2010). Thus, these introductory videos may speak and attract a specific audience; they may be meaningful for one audience, but meaningless and repulsive for another audience. MOOCs’ introductory videos act as movie or game trailers; they are selling or marketing tools for the university or the course developers. As such, they should consider content, activities, gestures, and even visuals that may appeal to diverse potential learners. Understanding that marketing tools such as introductory videos can affect viewers’ behaviors in ways that are consistent with the content of the message (Maibach, Roser-Renouf, & Leiserowitz, 2008), we suggest that producers of MOOC introductory videos learn and borrow from movie and game trailers to provide prospective learners with “a multimodal, multi-sensory ...experience that makes them feel a part of a [the upcoming course content]” (Stapleton & Hughes, 2005, p.40).

Conclusion

The complexity and richness of human learning is critical in online and distance learning (McCombs, 2000). MOOCs are a growing phenomenon that makes some to believe in their potential to democratize education. However, with the effect of culture on people’s understanding, interpretation of images, and content, this study problematizes MOOCs’ ability to reach diverse learners. It is certainly critical to understand that: “Images . . . are more than mere objects; they highlight cultural phenomena and convey social meanings” (Bansal & Zahedi, 2006, p. 1285). Indeed, the interpretation and meaning of visual images and videos “are a function of the underlying ideals and beliefs of social societies” as they play a critical role in the understanding of visual message (Scherer, 2010, p. 29). Considering that MOOCs heavily rely on videos, we contend that MOOC developers “need to be aware of the role of visual communication and the impact on the learner” (Hedberg & Brown, 2002, p. 23). With Olaniran et al. (2010), we state that “in order to increase the success of [MOOCs], [videos with content and structure] must be developed to enhance the learning environment and create a meaning learning experience for all [learners] involved (p.449).

Limitations and Further Research

This study was limited in its scope because it only focused on the introductory videos of three institutions of higher education. The scope of the study limits the generalizability of our findings. Nevertheless, focusing on introductory videos served as a means to look into culture in MOOCs. The study sheds light on the need to explore culture in MOOC settings, and how culture can affect learners and learning in MOOCs. This study opens a discussion on the cultural underpinnings and implications of MOOCs. For instance, if MOOCs are cultural artifacts, can they be useful for learners in different cultural contexts, without taking into account the cultural backgrounds of the diverse population of learners? Ignoring the impact of culture on e-learning environments such as MOOCs can have unintentional negative

consequences on learning; “It is imperative to match learning content to the needs of the learners such that this content is designed based upon a clear understanding of its cultural implications” (Olaniran et al., 2010, p. 450). We hope that this small-scale study will spark further research on the issue of culture in MOOCs.

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Appendix A

Elements of High Power and Low Power Distance Adapted From Bansal and Zahedi (2006) Cultural Content of Website Images

High power distance

Low power distance

High power distance	Low power distance
<p style="text-align: center;">Human in images</p> <ul style="list-style-type: none"> • Person in the image is in the position of authority. <ul style="list-style-type: none"> ○ The pose is formal. ○ A hierarchical structure is depicted. • In a group, <ul style="list-style-type: none"> ○ One person is depicted to have power above others. ○ Facial expressions and gestures depict power. ○ There is a physical distance between the person of authority and others. • Dress: <ul style="list-style-type: none"> ○ Formal or professional attire. • Focus: <ul style="list-style-type: none"> ○ Focus on one person (male or female). <p style="text-align: center;">Non-Human</p> <ul style="list-style-type: none"> • Buildings have grandeur. <ul style="list-style-type: none"> ○ Buildings are tall. ○ Grand structures with full perspective and sky. ○ High clouds, height of the buildings, columns of buildings. • Trees have grandeur. 	<p style="text-align: center;">Human in images</p> <ul style="list-style-type: none"> • No single person is in the position of authority. <ul style="list-style-type: none"> ○ The pose is casual. • More often, no human full figure is shown. • In a group, <ul style="list-style-type: none"> ○ No single person has power over others. ○ If a man is in authority, he is in background. ○ The pose is casual. ○ People do not seem engaged in important task. ○ No hierarchical structure is depicted. • Dress: <ul style="list-style-type: none"> ○ Casual attire. • Focus: <ul style="list-style-type: none"> ○ No focus on any one person. <p style="text-align: center;">Non-Human</p> <ul style="list-style-type: none"> • Single object is depicted in most images: <ul style="list-style-type: none"> ○ Single tree is shown.

Appendix B

Elements of Masculinity and Femininity Adapted From Bansal and Zahedi (2006) Cultural Content of Website Images

Masculinity	Femininity
<p style="text-align: center;">Humans in images</p> <ul style="list-style-type: none"> • Mostly men in pictures. <ul style="list-style-type: none"> ○ Men are authority figures. ○ When women in picture, they are posed, single with little authority. • More frequent non-smiling faces. • Focus: <ul style="list-style-type: none"> ○ Focus mostly on male(s). • Dress: <ul style="list-style-type: none"> ○ Men are in formal attire and women in casual dresses. • Overall color: <ul style="list-style-type: none"> ○ More black and somber colors. • Use of tools: <ul style="list-style-type: none"> ○ Man has the power tool. ○ If woman is shown with a power tool, she is merely posing. <p style="text-align: center;">Non-human objects</p> <p>Buildings/Structures:</p> <ul style="list-style-type: none"> ○ Solid man-made (artificial) structures. ○ Buildings of somber colors. ○ Buildings are solid 	<p style="text-align: center;">Humans in images</p> <ul style="list-style-type: none"> • Mostly females in pictures. <ul style="list-style-type: none"> ○ Females are shown in positions of authority. ○ Females are shown in the same rank as men. • More frequent smiling faces. • Family shown (husband-wife, children). • Relationship shown (communication). • Higher cases of natural, relaxed, holiday impression. • Focus: <ul style="list-style-type: none"> ○ Focus mostly on female(s). ○ Focus on babies and children. • Dress: <ul style="list-style-type: none"> ○ Women are more formally dressed. • Overall color: <ul style="list-style-type: none"> ○ More pink and other bright colors. • Use of tools: <ul style="list-style-type: none"> ○ Woman has the power tool. <p style="text-align: center;">Non-human objects</p> <p>Buildings/Structures:</p> <ul style="list-style-type: none"> ○ Sketch of buildings or houses. ○ Buildings have more bright color. • Other objects <ul style="list-style-type: none"> ○ Cartoons, funny characters. ○ Natural landscape, flowers, and river. ○ Artistic and funny drawings, mostly with bright colors.

Appendix C

Elements of Individualism and Collectivism Adapted From Bansal and Zahedi (2006) Cultural Content of Website Images

Individualism	Collectivism
<p style="text-align: center;">Humans in images</p> <ul style="list-style-type: none"> • Single person shown. • Focus: <ul style="list-style-type: none"> ○ When many people are shown, the focus is only on one individual. • Attitude: <ul style="list-style-type: none"> ○ Even when multiple people are shown, they are not communicating, they look in different directions. <p style="text-align: center;">Non-Human Objects</p> <ul style="list-style-type: none"> • Single object is depicted in most images: <ul style="list-style-type: none"> ○ Single tree is shown. 	<p style="text-align: center;">Humans in images</p> <ul style="list-style-type: none"> • Groups of people are depicted. <ul style="list-style-type: none"> ○ Family is emphasized. • Focus: <ul style="list-style-type: none"> ○ Multiple people are shown. • Attitude: <ul style="list-style-type: none"> ○ People are shown as gazing in same direction. ○ People are shown working on a common task. ○ People are shown interacting, competing, walking together. <p style="text-align: center;">Non-Human Objects</p> <ul style="list-style-type: none"> • The objects are shown in multiple, such as: <ul style="list-style-type: none"> ○ Multiple fountains ○ Multiple leaves ○ Multiple flags ○ Globe as collectivist object ○ Multiple funny objects



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The Use of Avatars in Gender Segregated Online Learning Within MOOCs in Saudi Arabia - A Rwaq Case Study



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Abstract

In Saudi Arabia, gender-segregation is a known issue within higher education that often deprives female tutors from providing online learning and Massive Open Online Courses (MOOCs). As well, students may not be getting the benefit of their experience and teaching. The purpose of this study is to develop an Avatar tool to represent a female tutor in a MOOC course with the aim of alleviating the issues of a gender-segregated society in online learning. This project will undertake and analyse a case study concerning the experience of females teaching a MOOC course on “Rwaq” the first Saudi Arabian platform, which was launched in September 2013. The literature on gender-segregation and education technology is reviewed. As an example, gender-segregated in higher education and online learning in Saudi Arabia, Virtual Learning Environments (VLE), Avatar technology in higher education, and finally the adoption of an Avatar tool in MOOCs platforms in SA are examined. One of the objectives of the study is to develop a social interaction environment with learners in online learning within MOOCs. The ultimate objective of this study is to examine if this Avatar tool could alleviate issues of gender-segregation for female lecturers in online learning courses within MOOCs in higher education in Saudi Arabia.

Keywords: online learning, MOOCs, Avatar, Rwaq, Saudi Arabia

Introduction

This paper is a continuation to the work the researchers have addressed in previous published proceedings (Adham, Lundqvist, & Parslow 2016). In 2012, MOOCs had a major revolution in the Western world and in 2013, MOOCs started to appear in a few countries in the Middle East. They are continuing to progress into a more widespread form of educational technology (Adham & Lundqvist, 2015; Subbian, 2013; Liyanagunawardena, Adams, & Williams, 2013). MOOCs as online courses are free courses, offered to a large number of learners at once, and conducted via video lectures and online assignments and exams (Universities UK, 2013). However, the overload of sources, educational knowledge, and economic, social, and cultural aspects of MOOCs might be considered a huge challenge for learners from developing countries (Liyanagunawardena, Williams, & Adams, 2013).

The recent situation in the Middle East presents some challenges regarding the impact of eLearning on social and cultural factors in higher education (HE), and these could restrict the progress of education. Gender for instance, has been found in some studies to be a very influential factor in terms of using E-learning; indeed, gender plays a significant role in how students engage with online courses (Garland & Martin, 2005). Moreover, males and females could possibly react in a different way to the material, methods presented, participation, and interaction with the tutor (Gulati, 2008).

The Kingdom of Saudi Arabia considered to be the keeper of the Islamic religion and one of the most conservative Muslim countries in the world, especially in regard to the status of women (Baki, 2004). The Saudi Arabian society is unlikely to support gendered-segregation due to its religious and cultural restrictions (Onsman, 2011). Moreover, in Saudi Arabia, the obligatory gender-segregation by religious, social, and cultural traditions has heavily impacted on the achievement of women in the higher education institutions, therefore; online learning might be good idea to remove such barriers (Baki, 2004). In Saudi universities, the adaptation of online education methods in the university culture; is considered a big issue in the development of E-learning system (Graham, Allen, & Ure, 2005). Overall, Saudi Arabia is facing the challenge of achieving international credits and competitive borders in higher education, while maintaining the traditional cultural standards.

Literature Review

Virtual World (VW) can be considered one of the key methods of producing E-learning platforms. It was developed from the three-dimensional worlds and engaging atmosphere of video games (Messinger et al., 2009). Moreover, VW motivate students, as they can be challenging and enjoyable, enhancing imaginary and social perception. They frequently influence students who do not do well in the traditional way of learning (Dede, 2004).

Virtual Learning Environments (VLEs) is the need of a worldwide learning experience and the learners' interface together might help to discover some upcoming directions by using widespread Internet software such as *Second Life* (SL; Christensen, Horn, & Johnson, 2008). In the 1990s, Avatar technology was first introduced, however, there were several technical difficulties, for example the slow phases for interaction (Oestreicher, Kuzma, & Yen, 2010). According to Fabri, Elzouki, and Moore (2007) the term Avatar is "(c) Comes from the Sanskrit language and can be translated as *God's Incarnation on Earth*" (p 275). As González, Santos, Vargas, Martín-Gutiérrez, & Orihuela (2013) defined Avatar as the digital representation of the individuals within the virtual world. It has an ability

to perform actions and to simulate human-to-human interactions to increase engagement and hence learning. Furthermore, Nowak and Rauh (2005) stated that the digital age users prefer to choose gender-compatible Avatars. The identity factors, for example, gender and age, have an effect on the use of Internet and perceptions of Avatars. It is possible that an Avatar can be viewed as a strong social indication affecting perceptions of computer users, motivating them to recognise interfaces as more social. Foundational research demonstrates how elements of the virtual world’s environment, such as SL Avatars, can be used in education, potentially increasing social presence (Jamaludin, Ho, & Chee, 2007). On the other hand, the use of VLEs and 3-D technology has been successfully implemented in higher education; nevertheless, it is still considered a new approach to teaching and learning in universities (Christensen et al., 2008). Then again, many well-known universities around the world, such as Harvard, Stanford, and the Open University have been using Second Life as a motivating part of their learning and teaching systems. Furthermore, benefits deriving from the application of Avatars in teaching include offering opportunities for social interaction and community development, dissolving social restrictions, reducing social anxiety, and enhancing learners’ motivation (Hamalainen, 2008). In a 2009 interview, Dyson stated that “The Avatar technology may present lectures and seminars to a real lecture presented in a lecture theatre” (Oestreicher et al., 2010, p.4).

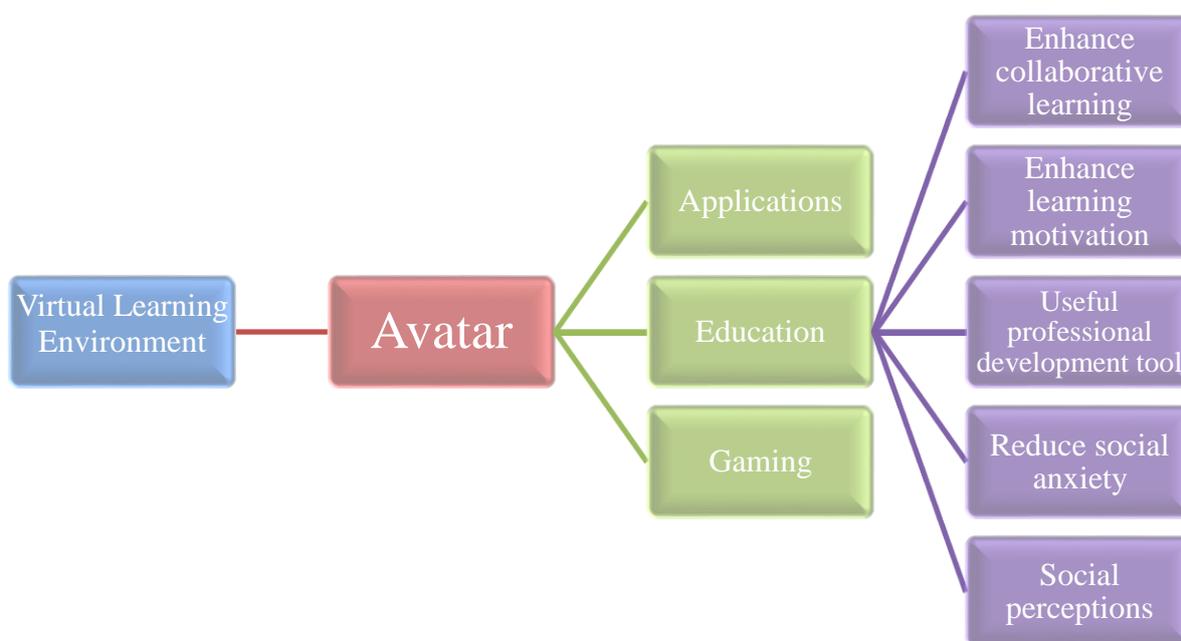


Figure 1. The Avatar technology.

Adopting the Avatar Technology in Saudi Arabian MOOCs

The Avatar technology might become an attractive method in teaching; however, results need to have good standards for teachers and learners (Oestreicher et al., 2010). In Saudi Arabia, one can come across certain limitations on online teaching for instance, not all students’ locations can provide good Internet connections to allow quick interactions. Another limitation is the language barriers and the issue of gender-segregation, where the majority of female academics don’t choose to appear physically within online courses. For example, Rwaq’s statistics showed that during the years 2015 and 2016 a total of 125 courses were run, however only 25 were led by female teachers.

Research Questions

1. To what extent can the role of Avatars enhance teachers' and learners' motivation in online learning and MOOCs in SA?
2. Can the use of Avatars in online courses impact/address issues of gender-segregation in SA?

Methodology

This research is ethnographic-action research; accompanying action research, ethnographic research can provide the tools and techniques. Recently, technology researchers have started to use the ethnographic research method to view the implementation of technologies within social systems (Hartmann, Fischer, & Haymaker, 2009).

It was decided within this research to adopt a mixed-methods approach to provide appropriate answers to all posed questions, and to draw on the strengths and minimize the weaknesses of the research. It is an exploratory case study, which is used widely in educational research (Yin, 2009). The case study approach focuses on adopting a new teaching method using Avatars in MOOCs to aid the exploration of this new technology by female tutors in teaching and learning. It is done to alleviate social and cultural issues so that female tutors can interact socially with learners in online course within MOOCs in SA. The case study has been structured upon consideration of two main pedagogical approaches – social constructivism and collaborative learning (associated with gender) – in order to provide a new perspective on technology enhanced learning with the aim to enable the use of these pedagogical theories. In this study, the data is collected by the researcher's online teaching experience as well as the cultural meaning of the participants' story using an auto-ethnography approach (Creswell, 2017). At the end of the course, an electronic survey using Google Forms was sent by the instructor (the researcher) to Rwaq participants' emails. The official communication required to obtain the permissions and ethical approval from University of Reading for conducting the study has already been carried out.

Data Analysis

The data analysis for this study consisted of both quantitative and qualitative methods, since there were three components of the data collection: the researcher's online teaching experience, the participants' perceptions, and the end of course (satisfaction) survey, as explained in this paper. The first component is the phenomenological analysis of qualitative data drawn from the teacher's online experience, whereby it was revealed how individuals make sense of a particular phenomenon (Savin-Baden & Major, 2013). This approach is generally centred on actual life experience, which is then narrated as a story, thus providing a general description of the experience. In this case, important elements are presented; for example, social interaction (teacher-to-student and student-to-student), feedback, assessment, challenges, and what the majority of the learners expect from their teacher.

The second component is the participants' feedback, which was analysed thematically. Thematic analysis is a "systematic approach to identify, analyse, and report patterns within data and interpreting it by seeking commonalities, relationships, or explanatory principles" (Braun & Clarke, 2006). It is commonly used in many fields, including case study research due to its flexibility. The data were

consequently coded into categories, according to information interpreted from the participants' feedback and comments.

The final component is the quantitative data analysis at the *End of Course Survey*. An electronic questionnaire was used, as this provide a rapid means of collecting information in an impartial way from participants (Stopher, 2012). The questionnaire was designed using *Google Forms* online software. Therefore, a link was sent to each Rwaq participant by e-mail through a disclaimer on the relevant platform. This facilitated the data collection and analysis. The validity and usability of such a system was thus evaluated; for example, its ease of use, ease of navigation, clarity of videos, and quality of sound. The quantitative data obtained were subsequently analysed using descriptive statistics and figures, which added depth to the questionnaire and triangulated the data obtained from the participants' perceptions and feedback.

Software Analysis Tool

A software analysis tool was used to assist with analysing the qualitative data gathered. NVivo version 11 is a Computer-Assisted Qualitative Data Analysis Software (CAQDAS) used in conjunction with a coding process applied to the data, whereby meaning is captured (Savin-Baden & Major, 2013).

The Participants

The sample for this study was drawn from a Rwaq course and included 5580 participants, fairly distributed by gender (48% females, 52% males). The participants originated from different Arabic-speaking countries, held different levels of educational qualifications, and varied in age (see Table 1).

Table 1

Participants' Ages and Levels of Educational Qualification

Degree	Total	Age range	No. of Participants
PhD	436	Under 20	0
		20-29	4
		30-39	207
		40-49	171
		Over 50	54
Master's degree	2349	Under 20	4
		20-29	931
		30-39	948
		40-49	344
		Over 50	122
		Under 20	78

Bachelor degree	1914	20-29	864
		30-39	724
		40-49	198
		Over 50	50
Secondary Education	881	Under 20	174
		20-29	376
		30-39	104
		40-49	201
		Over 50	26

The Setting

The setting for this study is a Meta-MOOC on a Rwaq platform, implementing the Avatar technology, “How to Design your own MOOC Course.” This was developed over a four-week period from August 8th to September 8th, 2016; using *Go-animate* software instead of videos of the presenter. The content and materials were then developed within two months and translated from English into Arabic, following Rwaq’s language procedure (Rwaq, 2015). The Avatar and corresponding videos were consequently created, with added recordings of my own (the teacher/researcher’s) own voice.

On May 15th, 2016 an online application was submitted to Rwaq, specifying the MOOC course title and outline. It was accepted with a request for a short introductory video of around two or three minutes’ duration. Here, the teacher was able to introduce herself, give an outline of the course, and indicate the target audience. This “promo-video” was published on May 24th, 2016, in order to initiate its publication. It was also shared on social media networks, namely Twitter and Facebook—using the teacher’s private accounts—as well as being disseminated via WhatsApp chat groups on mobile devices. On August 8th, 2016, the first MOOC course was launched on the Rwaq platform. This comprised four recorded lectures divided into 14 short videos, published on a weekly basis, it can be access via YouTube Rwaq Chanel (https://www.youtube.com/watch?v=-AVJh36L_N8). The *End of Course Survey* was published in the third week. Finally, at the end of the course, a test was administered, with a 60% pass mark, whereby successful candidates received a certificate of completion from Rwaq. The Table 2 is the four weeks Rwaq course outline:

Table 2

The Rwaq Course Outline

	Course outline/objectives
Week 1	Introduction to Massive Open Online Course MOOCs.
	What is MOOCs?
	The History and background of MOOCs.
	How to create a content of a MOOC course.
Week 2	Create a preview page.
	Summary of the course and instructor profile.
	Introduction video and welcome email.
	How to participate in the open platforms as a teacher.
	Create assessments (Multiple choice & quizzes).
Week 3	How to create the visual course content.
	How to create an interactive video.
	Style of your visual content.
	How to create a video using an Avatar.
Week 4	Online learning for Saudi females in higher education.
	Women opportunities for online teaching and their impact on Saudi culture.
	Arabic female role in online learning and MOOCs.
	Interview with female lecturers teaching experience on Rwaq (as part of the study).



Figure 2. Screenshot of video on the Rwaq course.

The Results

The relevant statistics from my first Rwaq course are presented below:

- Out of a total of around 5,580 participants, 30% completed the course.
- A total of 23% of all participants successfully completed the final test.
- A total of 14% of all participants completed the *End of Course Survey*.

The Researcher's Online Teaching Experience

When the teacher (First author) decided to teach a MOOC course, she realised that it is needed to create a quality course for students. She also wanted to share the ideas underpinning the PhD research, in order to gather perceptions and suggestions that could be helpful and inspiring to other female teachers in future. She therefore endeavoured to estimate how long it would take to prepare an online course. It ultimately took around two months to develop all the course materials, create the Avatar videos, and design the final test and survey. It was therefore more time-consuming to prepare than a traditional classroom course.

When the first lecture was published on the Rwaq platform on August 8th, 2016, a high number of comments were received from participants, posted under each video. This gave rise to some important questions. As a result, the teacher usually spent approximately three hours a day following participants' discussions on the messages, wall, and discussion boards, as well as regularly checking her own e-mail inbox. In this way, she attempted to respond to participants' questions and comments as promptly as she could, because it was considered very important for them to know that the teacher was consistently available to help them whenever required. As a result, an interactive online environment was established, where participants felt free to participate in discussions and respond to posted comments. This was intended to make them more comfortable about responding to each other on the discussion board.

In addition to the above, she tried to keep everything simple, including the course content, while also avoiding long videos, or long and complex questions in the final test. This was intended to help achieve the learning goals. For example, the participants were sent a welcome letter before the commencement of the course and the syllabus was posted in advance; thus giving the participants an opportunity to familiarise themselves with the course as a whole, as well as to reflect on whether it would meet their needs. Moreover, some of the participants were highly motivated and had an intrinsic desire to use the course material in their learning. They therefore wanted to practice applying what they had learnt and enjoyed the process (intrinsic motivation). However, others may only have been seeking to complete the course as a means of obtaining the certificate (extrinsic motivation).

Aside from the above, this course was highly feedback-oriented in the research study; with the participants being made aware from the beginning that they were welcome to share their views on the course. Researchers generally have an opportunity to gather feedback from participants at the end of an online course, but my teaching experience in this MOOC course strongly suggests that feedback should be encouraged and reviewed throughout a course.

The online teaching experience provided me as a teacher with many benefits, as I had a window on most of the participants' discussion. I was consequently able to note and correct any misinformation, while also easily identifying those participants who required additional help. In my opinion, this was a key advantage, as I believe that a good online course is one where the teacher is present and supports the students. In addition, I learned a great deal from the participants about massive online open courses (MOOCs), new platforms, and updated animation tools and software. Furthermore, my primary goal was for the participants to be able to access and learn from material within a socio-interactive environment. The significance of this is heightened by the cultural and social boundaries imposed on female teachers in Saudi Arabia.

Most of the participants proved to be greatly interested in the Avatar videos and I observed this in their comments, which I will consider in more detail in the section on "Participants Perceptions and Feedback" (see below). The online teaching experience, with the new phenomenon of an Avatar tool being used to create videos, combined with recordings of the teacher's own voice, was thus explored from a female perspective. In this regard, both positive and negative aspects of online courses were encountered. Some of the advantages of teaching via a Meta-MOOC, using an Avatar as opposed to the physical representation of a presenter in videos involved the sense of being more fully engaged with the interactive education. Here, an appropriate Avatar character was created to closely resemble myself, as a female teacher. The aim was to be able to interact with the students and provide a memorable experience that would increase confidence, enhance satisfaction, and reduce social boundaries.

Conversely, one of the disadvantages of this new technology was the length of time and amount of effort required to create an Avatar in the first place; as well as learning how to navigate and communicate using the relevant software which took approximately two to three months to develop the 15 videos. Amongst other factors, I found that I felt more comfortable explaining things in writing, as opposed to orally. Sometimes, I also needed to find the necessary resources to answer the participants' questions. Another finding derived from teaching this course was that the participants were sometimes very interactive, but without much control. Furthermore, this interaction took place in multiple directions.

The Participants' Perceptions and Feedback

The data collected related to the participants' feedback on the course content, material, Avatar tool, teacher-student interaction, and student-to-student interaction. Moreover, it pointed to ways in which these perceptions could impact their actions, approaches, and learning within the online educational environment. Besides, participants' feedback in the form of comments on course content is essential for the ongoing enhancement of course quality (Leckey & Neill, 2001).

The data collected were subsequently subjected to a six-phase thematic analysis method, as described by (Braun & Clarke, 2006), following their protocol for analysing qualitative data. The researcher analysed these themes in relation to the participants' responses to the course, coding them with NVivo software. The resulting five main themes are presented in the thematic map shown in (Table 3).

Table 3

Thematic Analysis of Participants' Responses

Themes	Codes	Excerpts from participants' comments
1. Students' perceptions: Positive-Negative-Neutral.	Course	"It looks like it's a clear and interesting course from the beginning."
	Videos	"I liked the presentation: very attractive and beautiful."
	Avatar tool	"The Avatar is moving very quickly." "Our... teacher programmed an Avatar to act on her behalf... which proved to be an effective method."
2. Students' impressions: Positive- Negative-Neutral.	Course content	"Wonderful and detailed explanation of the background to MOOCs."
	Organisation of the course	"One of the beautiful things in this course is the short duration of the videos and the organisation of information in an interesting way."
3. Students' satisfaction with the course.	Types of material (helpful/not helpful information)	"Very interesting and important topic in today's world, which depends on electronic platforms in everything."
	Technical	"I cannot download the attachments."
	Teacher	"You motivated me a lot to design and teach my educational materials as a MOOC."
	Platform	"Thank you very much and God bless you."
	Thanks	
4. Questions and assessments.	Requests	"I hope to continue to provide a series of courses in the subject, taking into account the practical side."
	Enquiries	
	Final test	"What is the software you used in the video?"
	Certificate	

		"What date is the exam?" "How can we receive the certificate?"
5. Social interaction.	Teacher-to-student (discussion)	"The most fantastic subjects, infused with passion for one's work and scientific development."
	Student-to-student (passive learning through others, interaction with other students via comments)	"I hope that your research results contribute to the promotion of Arab women, in sharing what you have learned and knowledge through distance education." "I am very happy to have participated in this course and admire the style and teacher's method of explanation." "I hope at the end of this course I can also offer a course like this to benefit my students."

*Note. (NB. These quotes were translated from Arabic into English by the researcher).

In addition, there are three social interaction tools provided by the Rwaq platform, which encourage communication, provide an opportunity for students to express their appreciation ("like" tools) and enable the sharing of website links, comments, questions, and responses to questions. The following are the three main sub-system functionalities:

1. The wall tool (negotiation page): publishing and sharing knowledge in posts, where students can write comments on each other's "statuses."
2. The messaging tool: participants send private messages to the teacher, which could facilitate and enhance student-teacher communication.
3. The Q&A tool: asking and answering questions in discussions between participants in relation to the learning topics.

In addition, there was a lecture report, only available to the female teacher. This provided relevant statistics, such as the number of students viewing the video, the number of topics completed by the students – as opposed to the number of topics covered by the course overall – and the number of comments posted. Moreover, these data needed to be compared with the results of the End of Course Survey, in order to achieve a satisfactory level of reliability. As a result, the hypothesis on the participants' competence and the effectiveness of the course as a whole would be supported.

The End of Course Survey

A quantitative research design was adopted, namely a survey approach. This End of Course Survey was administered only to those students registered on the Rwaq course. The teacher used a Google Forms e-questionnaire to gather the participants' views on their experience of the course and their perceptions of its effect on their studies and lifestyle, as well as exploring their level of satisfaction. The questionnaire designed consisted of multiple choice questions on 5-point Likert scales: Strongly Disagree, Disagree, Undecided, Agree, Strongly Agree; and Very Dissatisfied, Dissatisfied, Neutral, Satisfied, and Very Satisfied.

Questionnaire surveys are an ideal method of collecting information from a large number of participants, giving insights into the structure of the sample, as well as gathering data on their characteristics, views, and level of satisfaction. It is not easy to achieve this using other techniques (Salant & Dillman, 1994). Despite all these advantages, however, this approach is prone to certain limitations; for instance, it may not deliver optimal results if an understanding of historical context is required. Moreover, the interaction between the students and their teacher will have a major impact on learners' satisfaction and the challenges they perceive as inhibiting them. This is because the clarity of the content and its organisation are also considered as the keys to successful learning. In fact, Fekula (2010) states that the teacher's role is very important for ensuring student satisfaction.

The End of Course Survey investigated student satisfaction with the course and the Avatar experience on the Rwaq platform, as well as the factors affecting this satisfaction, such as course design and content, motivation, teaching quality, learning style, positive perceptions of online learning, student-teacher and student-student interaction, and familiarity with technology. The e-questionnaire responses were then analysed using Microsoft Excel, which supports various chart formats; for example, pie charts and tables. These can be easier to read than a numerical table. Moreover, all the data were given as percentages. The following are some of the findings derived and an analysis of the online End of Course Survey with total of 830 responses.

Knowledge of Massive Online Open Courses (MOOCs). When the participants were asked about their knowledge of open educational platforms, 42% of them replied that they were already registered on a MOOC platform. Twenty percent stated that they had heard of them, but only 5% claimed to be MOOC experts (Figure 3).

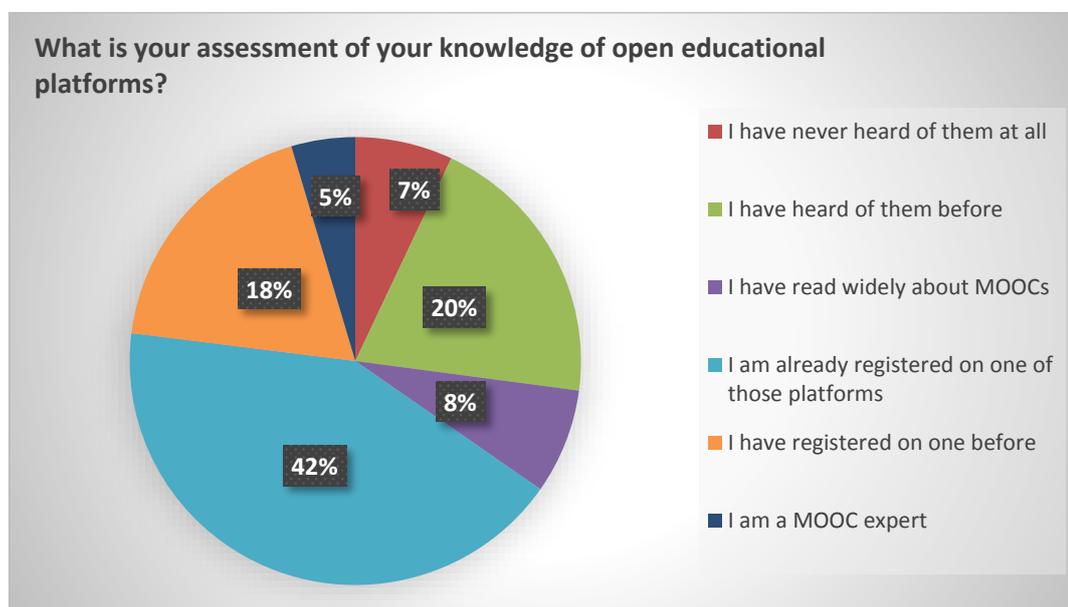


Figure 3. Percentages of students' responses concerning open educational platforms.

The course learning outcomes. For the questions about what the students had gained by completing the course, most of the respondents thought they had learned how to design a MOOC course. Around 18% found the online learning experience interesting and similarly, 18% declared that their learning skills had improved. Only 7% stated that they sought improved interaction with their teacher and peers (Figure 4).

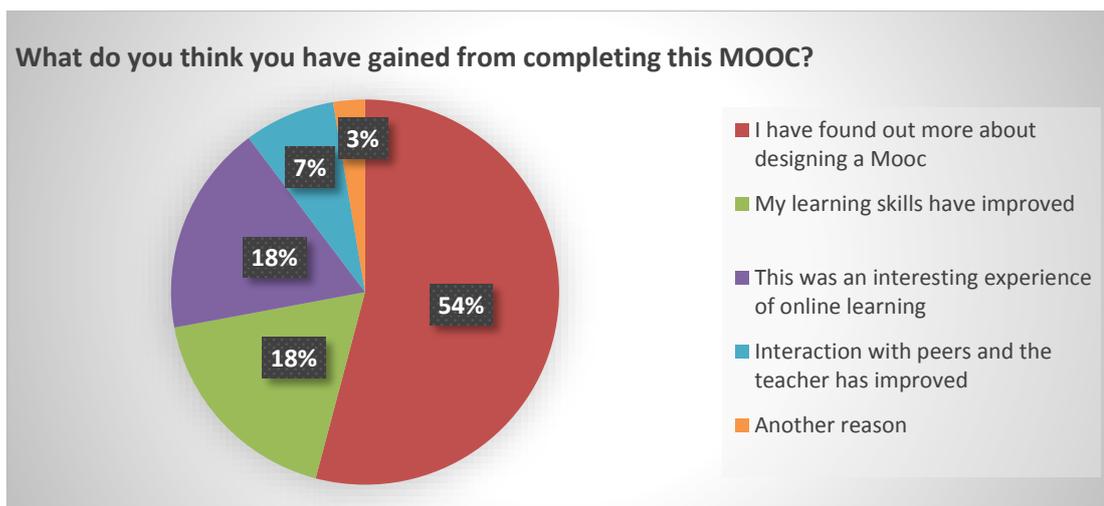


Figure 4. Percentages of students' responses concerning the MOOC learning outcomes.

Satisfaction with student-teacher interaction via Avatar technology. The question; how satisfied or dissatisfied were you with the interaction you achieved with the teacher using the Avatar instead of the video of the presenter herself? It is clear from Table 4 that almost half the students were "Satisfied" with the level of interaction achieved with their teacher using the Avatar tool and more than a third were "Very Satisfied." In contrast, just 13% were "Neutral" and only 3% were "Dissatisfied."

Table 4

Percentages of Students' Responses Concerning Interaction With the Teacher

Overall satisfaction with interaction with the teacher	Frequency	%
Very dissatisfied	0	-
Dissatisfied	24	3%
Neutral	111	13%
Satisfied	406	49%
Very satisfied	289	35%
Total responses	830	

Learning style. As displayed in Figure 5, the majority of the students preferred watching the course videos, while around 13% were more interested in reading the comments made by their peers. However, only 3% preferred posting their own comments on the "wall."

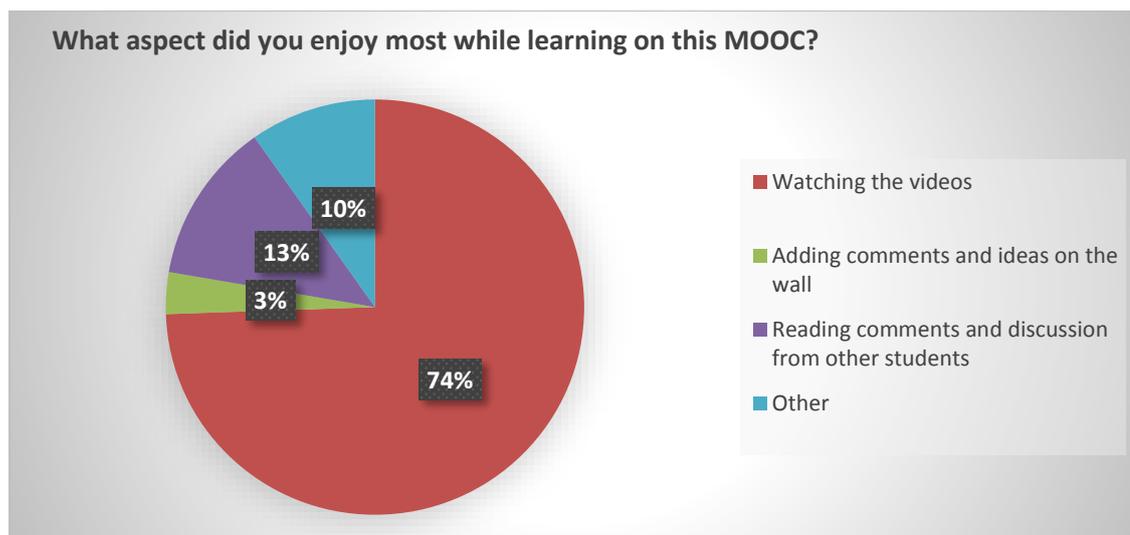


Figure 5. Percentages of students' responses concerning their preferred learning styles.

The lecturer's appearance in the video-recordings. This last question concerned the appearance of the actual teacher in the MOOC material, whereby half the participants stated a preference for Avatar technology, rather than a video of the actual teacher; while approximately one third of the participants appeared to favour a video of the teacher herself, compared to the 19%, who declared that they would rather see a PowerPoint presentation, with just a voiceover from the teacher (Figure 6).

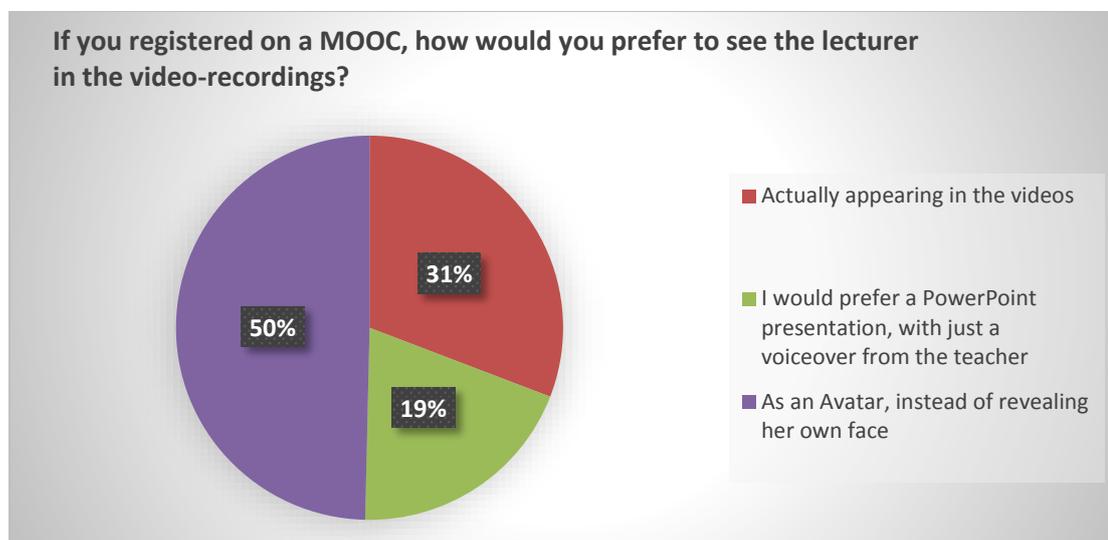


Figure 6. Percentages of students' responses to the lecturer's appearance in videos.

Discussion

This section discusses the study results, especially the characteristics of the qualitative data collection, in order to try and understand the social phenomena and quantitative data associated with the relationship between the effectiveness of the course and learner satisfaction. The study has been

designed to capture the experience of online teaching, whereby a female teacher uses an Avatar tool, instead of appearing in person in video material. The participants' responses are therefore interpreted according to the context being investigated (Savin-Baden & Major, 2013). The findings consequently indicate that the social presence of the student and teacher promote shared control over online learning. A good example of student-teacher interaction involved the latter answering the students' questions and responding to their comments. Besides, enhanced social interaction is likely to lead to greater effectiveness, efficiency, satisfaction, and engagement amongst students.

Alternatively, the findings from the participants' perceptions and feedback revealed that feedback was mainly positive regarding the course content and its organisation, videos, course materials, assessment, Avatar tool, and social interaction. Moreover, in the context of this study, an organisation's culture can be suggested as influencing participants' views on female teachers, which may be observed from the comments; for example: "The Avatar is considered as one of the available options for delivering an electronic lecture at the discretion of the female lecturer concerned." Therefore, engaging in discussion with participants will generate ideas and shed light on the phenomena under investigation. The reason for this is that perceptions gathered from participants serves to alleviate the social boundaries associated with female teachers on MOOC platforms. Furthermore, some Avatars are generated to influence participants' perceptions and the first impression expressed in the present feedback was "inspiration," whereby one of the female participants stated that she would, "teach a MOOC course using an attractive Avatar tool; thank you for inspiring me." Another participant indicated that this is a successful solution for online students: "I will use the Avatar in my future educational videos, because I think that the students will like the idea."

In the End of Course Survey, most of the participants stated that their primary purpose for registering on the course was to learn how to design a MOOC, followed by using a MOOC platform to improve their learning skills; enjoying an interesting online experience, and engaging in more effective interaction with their teacher and peers, thus indicating the social function of MOOC platforms. Other identified motives which the teacher extracted from the students' video comments included peer-discussion, the sharing of ideas and knowledge, obtaining updates on new topics and technology, and finding the Avatar presenter interesting.

Moreover, the majority of the students declared that they would register in another MOOC with an Avatar presenter, rather than one where the teacher is actually represented in person. This illustrates the specific cultural context of Arab societies, especially in Saudi Arabia. It was reflected in most the positive comments made by the participants concerning the videos, when their perceptions and feedback were analysed. Overall, the survey results and the participants' perceptions also showed that most of the participants were "very satisfied" with their social interaction when the teacher used an Avatar character, which answers the submitted research questions at the beginning of this paper.

Limitations

The following are some of the limitations and difficulties that were faced by the teacher/researcher throughout the course, including content and technical issues. Specific examples include that some of the participants requested a practical dimension to the course, rather than mere information and concepts related to MOOCs. Another issue arising concerned the nature of the assessment, with some of the participants seeking weekly tests, instead of a single final test. I explained that this was impossible within the time constraints of the course. Furthermore, technical problems arose over the deadline for submitting the final test, where I failed to manage the system's clock correctly; the deadline for the test

was intended as midnight on September 8th, but the actual cut-off was at 00:00, at the start of the day. This disappointed some of the participants and so I decided to extend the test deadline for one more day.

Conclusion

As there are often limitations and issues surrounding online learning via MOOCs in gender-segregated societies, such as in Saudi Arabia, this study has aimed to develop a socio-interactive environment for communication, by adopting Avatar technology to represent female lecturers. This serves to enhance their presence, as well as encouraging social interaction between male and female participants. The hypothesis is that the use of Avatar technology for MOOCs could increase the participation of female instructors and resolve the issues they may face in this regard.

This case study, therefore, examines the impact of a female Avatar applied to a MOOC. The usability and performance of Avatars is consequently concluded from feedback on course content, course organisation, and videos, as well as from formal assessment and a survey. In addition, the research methodology is clearly identified throughout the study, in an application of mixed data collection methods.

The qualitative data and End of Course Survey results, alongside the literature review, are subsequently triangulated to arrive at a final conclusion. This study experiments with a new MOOC teaching approach, whereby an Avatar tool is adopted to ascertain its perceived and measured effectiveness, as highlighted earlier, in order to reach a systematic conclusion.

Overall, it is believed that the research questions submitted at the beginning of this study have been effectively addressed and determined. One of the most important principles of online learning is that it should be an enjoyable experience. One way this can be achieved is by developing an Avatar that can engage learners. After analysing the findings from the present study, it was found that most of the students' feedback was in support of the Avatar experience. The number of positive responses was surprising, having expected more critical comments. The reasons for this positive response were based on the need for more female instructors on MOOCs, as well as a desire for more motivational learning approaches. In conclusion, the findings point to some important benefits of adopting Avatars on MOOCs. Avatars may therefore be considered as new tools for online learning platforms, both in Saudi Arabia and worldwide.

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Modeling Students' Readiness to Adopt Mobile Learning in Higher Education: An Empirical Study



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Abstract

Mobile devices are increasingly coming to penetrate people's daily lives. Mobile learning (m-learning) is viewed as key to the coming era of electronic learning (e-learning). In the meantime, the use of mobile devices for learning has made a significant contribution to delivering education among higher education students worldwide. However, while m-learning is being widely adopted in developed countries, the adoption of such an approach in developing countries is still immature and underdeveloped. Developing countries are facing several challenges and lagging behind in terms of adopting m-learning in higher education. Thus, this paper explores the factors that have an impact on students' intentions and readiness to adopt m-learning in higher education in Jordan. Based on the data collected from the field, we examine Jordanian students' requirements and preferences in terms of m-learning design, and we also investigate their concerns about adopting m-learning. This empirical study collected data from students using a paper-based questionnaire. The results reveal that students' intentions to adopt m-learning is influenced by several factors that include the relative advantage, complexity, social influence, perceived enjoyment, and the self-management of learning. By providing a picture of students' willingness to adopt m-learning, this study offers useful and beneficial implications for developers of m-learning applications and for educational providers to guide the design and implementation of comprehensive m-learning systems.

Keywords: mobile learning, m-learning adoption, e-learning, technology acceptance, technology acceptance, perceived enjoyment, self-management of learning, developed countries

Introduction

With technology becoming increasingly more powerful, it is spreading and dominating many aspects of people's lives, particularly education (Al-Adwan, Al-Adwan, & Smedley, 2013). Technology has provided the education field with significant tools to support educational processes (Seliaman & Al-Turki, 2012). In particular, the considerable advancement of mobile technology over the past decade, the increasing proliferation of mobile devices, and the availability of the Internet have made mobile learning (m-learning) the current trend in learning in higher education worldwide (Shorfuzzaman & Alhussein, 2016). The affordability, sophistication, and popularity of mobile devices among higher education students have encouraged education providers to consider using them as a new medium of learning. Mobile devices are increasingly becoming more capable of performing all the functions that are necessary in the learning process. Mobile technology consists of various applications and tools that allow learning to be more dynamic and accessible, so that students are no longer restricted to their classrooms when it comes to interacting with learning processes (Callum, Jeffrey, & Kinshuk, 2014).

M-learning is defined in a range of ways throughout the literature. According to Farley, Murphy, and Rees (2013), researchers are struggling to provide a particular definition of m-learning that is educationally relevant and sufficiently different from e-learning. Traxler (2007) points out that the characteristics of m-learning raise several difficulties in terms of developing a unified definition of m-learning. He identified three main characteristics that contribute to the difficulty of defining m-learning - contextual, personal, and situated characteristics. In the context of higher education, Osman, El-Hussein, and Cronje (2010) argue that the portability and mobility of mobile devices have a significant influence on the definitions of m-learning that have been broadly presented in the literature. Considering a mobile device as a signifier, three main categories can be interpreted based on the concepts of mobility: the mobility of learners, the mobility of technology, and the mobility of learning in the landscape of higher education. Based on the above, Wang, Wu, and Wang (2009) define m-learning in the context of higher education as the "delivery of learning to students anytime and anywhere through the use of wireless Internet and mobile devices, including mobile phones, personal digital assistants (PDAs), smart phones and digital audio players" (p. 93). They state that m-learning is viewed as the follow up of e-learning, the concepts of which are rooted in distance education. The mobility and ubiquity of mobile devices prevent learning from being restricted to a specific time and location (Osman et al., 2010). Mobile devices have the capacity to connect to the Internet and deliver instructions and materials to students at anytime and anywhere. M-learning promotes learner-centred and personalized learning approaches by enabling students to interact and engage with educational processes away from traditional learning places such as classrooms and desktop computers. In other words, mobile devices offer place independence that enables both students and tutors to manage their time effectively.

While m-learning offers significant potential capabilities (Callum & Jeffrey, 2013), the adoption of such technology faces many challenges, which suggests that the adoption of m-learning is not an easy decision to make (Wang et al., 2009). In spite of the rapid growth and capabilities of mobile technology and networks, m-learning is considered as an emerging trend and is still in its infancy in higher education (Thomas, Singh, & Gaffar, 2013). The slow adoption of m-learning rates by higher education institutions may relate to several challenges. According to Tabor (2016), these challenges include connectivity, small screen sizes, limited computation power, limited memory capacity, short battery life, reduced input

capabilities, unfriendly user interfaces, and complex input methods. Small keyboard or touch screens may require learners to allocate more time searching for information than they need to read it. Therefore, the success of m-learning is fundamentally based on students' willingness to adopt a new technology that is different from previous learning styles. In order to provide suitable m-learning services, it is critical to investigate students' adoption processes (Liu, 2008; Shorfuzzaman & Alhussein, 2016). According to Sarrab, Al Shibli, and Badursha (2016), the key success factors with regard to m-learning essentially depend on students' desire and intellectual engagement in m-learning activities. Thus, examining students' perceptions and readiness to adopt m-learning is significantly important for the successful implementation of this technology in higher education.

Research Objectives

Developing countries generally struggle to utilise educational technology and implement effective distance learning in their education systems (Deb, 2011). Compared to developed countries, developing countries lack telecommunication infrastructure required for successful implementation of distance learning. Additionally, the lack of human and economic resources prevents developing countries to acquire and utilise distance learning.

Another conventional aspect is that the neutrality of IT among cultures is dissimilar, as each technology represents the culture of its producing country (Shaukat & Zafar, 2010). Developed countries are more sensitive to technology since the creation and design of the technology reflects the aspirations and demands of their culture and thus can be beneficially employed immediately. Consequently, developing countries, which passively adopt technology as standard products, will struggle to cope with the radical changes caused by the adoption of technology. Technology was originally designed in industrialised and developed countries, and this may lead to socio-cultural barriers that diversely affect the acceptance of technology in developing countries. Deb (2011) points out that

Successful use of IT requires much more than mere installation and application of systematized knowledge. It also requires the application of implied knowledge regarding the organization and management of the technology and its application to the contextual environment in which it is to be used. This implied IT knowledge often represents experience with the deployment of previous technology accumulated over time, such experiences contributing towards the shaping of new technology. (p.35)

In Jordan, m-learning has not been formally adopted in the higher education institutions. On the other hand, this has not been the case for e-learning as various e-learning technologies are currently being utilized by both students and lecturers. However, the expectations with regard to adopting e-learning in Jordanian higher education institutions are still below those operating at the international level (Almarabeh & Mohammad, 2013). According to the reports of the Jordanian Telecommunication Regulatory Commission (TRC) (2016), the number of mobile users reached 14 million by the first quarter of 2016, with a penetration rate of 148%. Additionally, the total number of internet users in Jordan is around 8.1 million with a penetration rate of 84%; however, the increased number of mobile devices and

wireless networks does not necessarily indicate that m-learning will be adopted without any obstacles. Therefore, in order to successfully adopt m-learning in higher education, several factors must be addressed, specifically the driving factors that influence students' acceptance (Thomas et al., 2013; Callum, 2010).

While m-learning is being widely adopted in educationally developed countries, Jordan, as a developing country, is still lagging behind and facing a variety of challenges in terms of adopting m-learning. Developed countries such as the USA, the UK, and Japan are establishing policies and plans to meet the growing demand associated with learning (Shorfuzzaman & Alhssein, 2016). They are developing learning strategies and plans that make best use of educational technologies, specifically mobile devices. Based on the above discussion, it is clear that several studies have been conducted in educationally developed countries to adopt m-learning in practice. Thus, it is important to investigate the factors that influence students' perceptions of m-learning and their readiness to adopt m-learning technology in higher education in developing countries. Therefore, the aim of this study is to help overcome the lag in m-learning adoption in the context of higher education institutions in developing countries, especially in Jordan. Therefore, this study investigates the influence of several factors on students' intention to use m-learning. These factors include: relative advantage, complexity, social influence, perceived enjoyment, facilitating conditions, and self-management of learning. Beside the importance of self-management of learning to m-learning adoption, it has not been intensively examined. Additionally, this study examines the moderating effects of three variables include: age, gender, and course type. To our knowledge, compared to age and gender, the moderating effects of course type have not been investigated in the context of m-learning.

The Research Model

Organizations invest heavily in information systems (IS) and information technology (IT) to improve performance, reduce costs, and increase service quality (Mojtahed, Nunes, & Peng, 2011). Despite the magnificent performance improvements associated with using IS, users often resist using such systems. Such resistance results in frustration for organizations due to the financial loss associated with low success rates. Therefore, the lack of user acceptance is considered as the pivotal obstacle to the success of new IS (Abbasi, Tarhini, & Hassouna, 2015). As a consequence, several models have been proposed in the IS literature attempting to clarify the socio-technical phenomenon of users' acceptance of IS. The Technology Acceptance Model (TAM) (Davis, 1989) and its extensions, and the Unified Theory of Acceptance and Use of Technology (UTAUT) (Venkatesh, Morris, & Davies, 2003) are among these noteworthy theoretical models aiming to investigate users' behavioural intentions and/or usage of IS and IT. These models have been widely used in many IS contexts such as healthcare informatics (Al-Adwan, 2015), online shopping (Celik, 2016) and banking (AlKailani, 2016). According to Mojtahed et al. (2011), the original versions of technology acceptance theories and models are rarely employed by researchers as they stand. Therefore, researchers tend to modify these models' constructs and relations by incorporating additional context-specific elements in order to address the requirements and contexts of particular studies. M-learning has its own distinctive characteristics, and it also differs from other IS/IT contexts (Almasri, 2015). Thus, since the focus of this paper is to investigate students' perceptions when it comes to

adopting m-learning, it proposes a contextualized framework that is developed specifically to examine the adoption of m-learning by students in the context of higher education. As Figure 1 suggests, the proposed framework consists of seven constructs. M-learning is not officially implemented in Jordanian higher education, and thus the dependent variable of the research framework is behavioural intention (BEI) rather than usage behaviour. The independent variables include relative advantage (RAD), complexity (COM), facilitating conditions (FCO), perceived enjoyment (PEN), social influence (SIN), and the self-management of learning (SML).

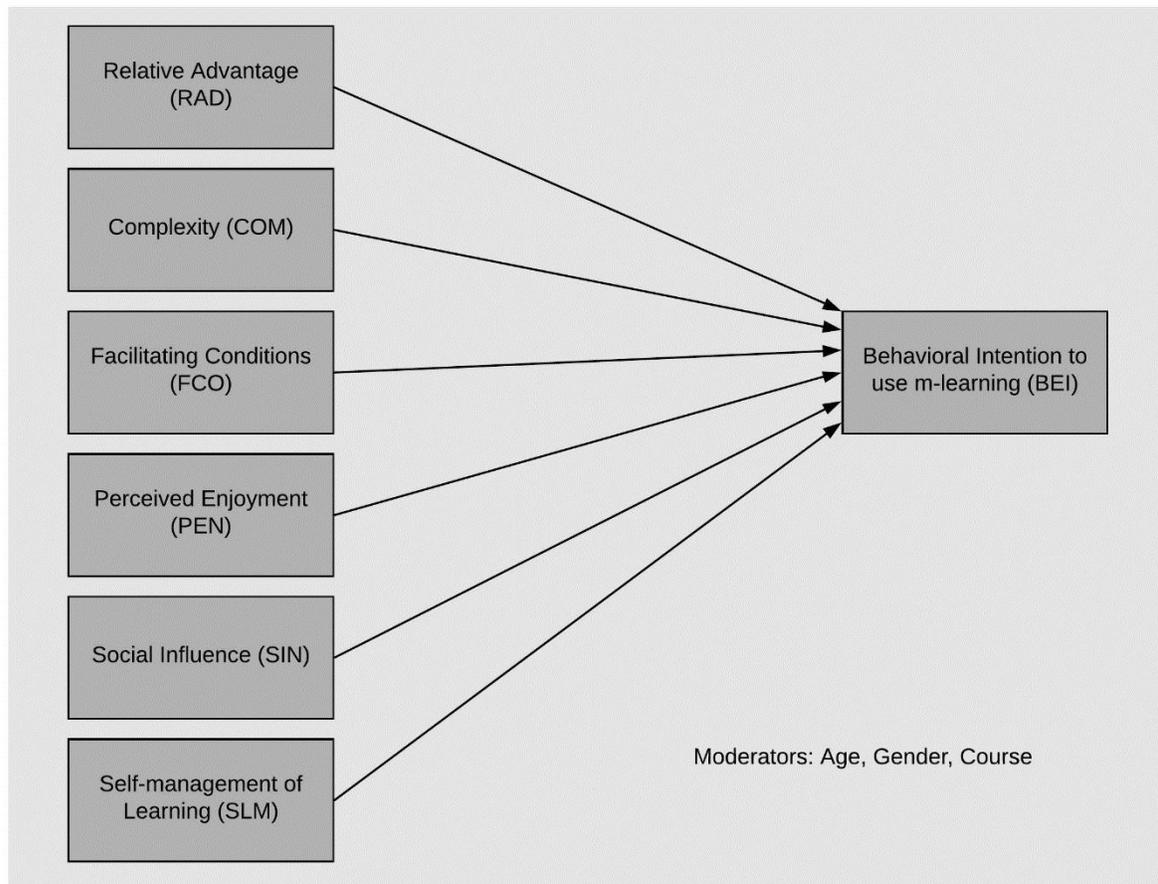


Figure 1: The research model.

Relative Advantage (RAD)

According to Rogers (2005), relative advantage refers to the extent to which an innovation or a technology is perceived as being more useful than its precursor. Relative advantage is similar to the concept of perceived usefulness from TAM, and also consistent with the performance expectancy construct from UTAUT. In the m-learning environment, this indicates that students expect to find m-learning useful, as well as to enable them to accomplish their educational tasks in an effective and timely manner (Jackman, 2014). In other words, there is a strong likelihood to adopt m-learning when students perceive it to be beneficial and useful to them. Arpaci (2014) points out that the relative advantages of m-learning over a traditional learning environment results from the distinctive characteristics of mobile devices. With

features such as ubiquity, flexibility, accessibility, and connectivity, students will consider m-learning useful because it allows them to use a device of their choice, and access information conveniently without any restrictions in terms of place and time.

Complexity (COM)

Rogers (2005) refers complexity to “the degree to which an innovation is perceived a relatively difficult to understand and use” (p.15). The more an innovation or technology is easy to use, the less effort is needed to conduct a given job (Davis, Bagozzi, & Warshaw, 1992). Complexity is the opposite to the construct of effort expectancy from UTAUT and the perceived ease of use construct from TAM. Rogers (2005) points out that complexity has a negative influence on the adoption rate of an innovation. Venkatesh (1999) suggests that effort-oriented constructs are expected to have a significant effect during the initial stages of using a new innovation, and the effect of effort expectancy will be decreased as the users acquire more experience. Although it has been claimed that the effect of complexity is not as important as relative advantage, its significance has been widely recognized recently in the domain of user interaction, interface, and usability (Joo, Lim, & Lim, 2014). As a consequence, it has been argued that complexity can be a key barrier to the adoption of a new innovation. With regard to m-learning, if students perceive hardware and software for m-learning to be user-friendly, then they may be very keen to adopt it in their education (Sahin, 2006). Students will be expecting the different activities and processes of m-learning to be easy and to function simply, particularly in the light of the limited capabilities of mobile devices such as smart phones (Liaw, Hatala, & Huang, 2010). Mobile devices have less capabilities (i.e., small memories, limited screens, and slow processors) compared to PCs.

Perceived Enjoyment (PEN)

Making the process of learning enjoyable and less tiresome to students is constantly considered one of the main aspects of importance in educational environments (Huang, 2014). Davis et al. (1992) state that perceived enjoyment refers to the level to which the use of an innovation is enjoyable aside from any performance consequences that may be anticipated. Perceived enjoyment is considered as an intrinsic motivator in which users are involved in an activity due to their interest in the activity (Iqbal & Qureshi, 2012). Prior research suggests that the acceptance of new systems is influenced by the perception of intrinsic-related constructs such as perceived playfulness and enjoyment (Masrek, 2015). This is because individuals who experience gratification and pleasure during the use of an innovation or a system are more likely to use it subsequently. Intrinsic motivators such as perceived enjoyment, are widely used to examine individuals' perceptions of educational innovation (Wang et al., 2009). Previous studies indicate that perceived enjoyment is a substantial factor when it comes to students' intentions to use m-learning (Jung, 2014; Cheng, 2014). Liu, Han, and Li (2010) explain that while the learning process in general may generate a sense of stress and pressure for students, it is important to develop m-learning applications that are enjoyable and interesting to help smoothen the adoption decision. Additionally, it has been argued that students are intrinsically encouraged to engage with learning activities particularly when they sense that the learning style is viewed as enjoyable, novel, and exciting. Therefore, mobile technologies are expected to lead to a learning environment that allows students to access the learning process in a more enjoyable fashion (Martin & Ertzberger, 2013).

Social Influence (SIN)

Social influence is defined by Venkatesh et al. (2003) as “the degree to which an individual perceives that important others believe he or she should use the new system” (p. 451). Social influence is viewed by users as the social advantage that results from the use of a new technology. From the m-learning perspective, previous research demonstrates that students’ decisions to use m-learning is significantly influenced by peer students and/or important individuals such as instructors (Mtebe & Raisamo, 2014; Abu-Al-Aish & Love, 2013). The literature suggests that the impact of social influence will be significant in the initial phases of m-learning and will gradually decrease over time as m-learning becomes more widely used (Ugur, Koc, & Koc, 2016).

Self-Management of Learning (SML)

Self-management as a learning construct is regarded as one of the fundamental issues in the educational field due to its significant role in enabling positive learning performances and acting as a crucial determinant of learning achievement (Huang, 2014). Smith, Murphy, and Manhoney (2003) refer to SML as “the degree to which an individual perceives self-discipline and can engage in autonomous learning” (p. 60). Wang et al. (2009) point out that SML encourages independent, self-directed, and autonomous learning. Self-regulated students are the ones who are cognitively and behaviourally active participants of their own learning processes, without depending on others (e.g., instructors, parents) (Zou & Zhang, 2013). Abar and Loken (2010) explain that self-directed learning requires students to sustain cognitions and behaviours systematically in order to achieve learning goals. In the context of m-learning, the skill of self-directed learning is an essential success factor when it comes to engaging with flexible delivery, distance education, and resource-based learning such as m-learning (Prajapati & Patel, 2014). Students are away from instructors, peers, and education providers, and thus they are required to acquire skills and competences to manage their own learning effectively.

Facilitating Conditions (FCO)

The construct of facilitating conditions refers to the extent to which individuals believe that both technical and organisational infrastructures exist to support the use of a particular technology (Venkatesh et al., 2003). Facilitating conditions refer to technical and organisational facilitators that help users to overcome obstacles related to the use of a technology. They have a great impact on technology adoption and infusion, as many studies highlight the important role of facilitating conditions in influencing adoption behaviour (Lu Chun-Chun-Sheng, & Chang, 2005). The availability of proper facilitating conditions (e.g., training courses, technical support, and adequate resources) is crucial for technology adoption (Aypay, Celik, & Aypay, 2012). The absence of facilitating conditions could lead to a negative impact on IT usage and behavioural intentions as the absence of facilitating resources generates obstacles to usage, or could discourage the formation of negative behavioural intentions towards usage. According to Iqbal and Qureshi (2012), students face several technical challenges when they switch to m-learning. Technical issues such as limited processing speed, low bandwidth, unfriendly user interface, and less surf-ability may prevent users adopting m-learning. The devices used in m-learning range from mobile devices to laptop computers that acquire heterogenous capabilities such as memory capacities, computational power, and display for ubiquitous media learning access (Hossain & El Saddik, 2008). Thus, learning materials have to be transcoded to be viewed effectively by learners from any device. Consequently, guidance and technical support are essential to facilitate students’ engagement with m-learning

(Concannon, Flynn, & Compbell, 2005). In particular, the functionality of personal mobile devices and support from learning providers appear to be vital factors.

Methodology

The focus of this study is to investigate students' behavioural intentions when it comes to adopting m-learning in higher education in Jordan. Consequently, the participants who took part in this research are undergraduate students from different courses at two Jordanian universities (see Table 1). Convenience sampling technique was used to identify the participants to whom 350 paper-based questionnaires were sent. Faculty staff at both universities participated in facilitating the distribution and collection of the questionnaire. While a total of 350 questionnaires were distributed to participants, 234 questionnaires were returned indicating a response rate of 66.8%. Out of the 234 returned questionnaires, six were reported as incomplete and thus were excluded from further analysis. Overall, a total of 228 (n=228) questionnaires were acceptable for analysis. As the sample's profile shows in Table 1, 60% of the participants were male and 40% were female. The largest age group was participants aged <20 years old, representing 42% of the sample, and participants aged between 20-27 formed 39% of the sample. More than half of the participants (56%) use smartphones to access the internet, while only 8% use desktop/PC. Also, 23% of the participants use laptops and users of tablets made up 12% of the sample. Such percentages reflect the popularity of mobile devices among higher education students.

Table 1

The Sample's Profile

Measure	Item	Frequency	Percentage (%)
Gender	Male	137	60%
	Female	91	40%
Age	<20	96	42%
	20-27	89	39%
	>27	43	19%
Mobile device used to access Internet	Desktop/PC	17	8%
	Laptop	53	23%
	Smart phone	127	56%
	Tablet	28	12%
	Other	3	1%
Course	Translation and Languages	39	17%
	Educaton	21	9%
	Business Administration	79	35%
	Finance and Accounting	57	25%
	IT related	32	14%

Data was collected from participants through a survey questionnaire comprising of 27 items in order to evaluate the seven constructs (see Table 2). A 4-point Likert rating scale was used to measure all the

items, ranging from (1) strongly agree to (4) strongly disagree. All items were adopted from previous and well-established mobile technology research (Shorfuzzaman & Alhussein, 2016; Celik, Sahin, & Aydin, 2014; Wang et al., 2009). In order to evaluate the content validity, the questionnaire form has been approved by at least five experts in the domain of IS and educational technology. Finally, the questionnaire form was translated into Arabic by a professional translator. In order to evaluate the accuracy of the translation process, another professional translator was employed to translate the questionnaire form back into English.

Table 2

The Questionnaire Form

Construct	Item
Self-management of learning (SML)	SML1: "I am self-directed when it comes to study". SML2: "In my studies, I set goals and have a high degree of initiative". SML3: "I am able to manage my study time effectively and easily complete assignments on time". SML4: "In my studies, I am self-disciplined and find it easy to set aside reading and homework time".
Perceived Enjoyment (PEN)	PEN1: "Using m-learning will give enjoyment to me for my learning". PEN2: "Using m-learning will lead to my exploration". PEN3: "When using m-learning, I will not realise the time elapsed". PEN4: "Using m-learning will give enjoyment to me for my learning".
Relative Advantage (RAD)	RAD1: "I would find m-learning useful in my learning". RAD2: "Using m-learning enables me to accomplish learning activities more quickly". RAD3: "Using m-learning increases my learning productivity". RAD4: "If I use m-learning, I will increase my chances of getting a promotion".
Social Influence (SIN)	SIN1: "People who influence my behaviour will think that I should use m-learning". SIN2: "People who are important to me will think that I should use m-learning". SIN3: "The seniors in my organisation have been helpful in the use of m-learning". SIN4: "In general, my organisation has supported the use of m-learning".
Facilitating Conditions (FCO)	FCO1: "I have the resource necessary to use mobile learning". FCO2: "I have the knowledge necessary to use mobile learning". FCO3: "A specific person or group should be available for assistance with mobile learning difficulties". FCO4: "Internet speed would be appropriate for m-learning".
Complexity (COM)	COM1: "My interaction with m-learning would be clear and understandable". COM2: "It would be easy for me to become skilful at using m-learning". COM3: "I would find m-learning easy to use". COM4: "Learning to operate m-learning is easy for me".
Behavioural Intention (BEI)	BI1: "I intend to use m-learning in the future". BI2: "I predict I would use m-learning in the future". BI3: "I plan to use m-learning in the future".

Data Analysis

Structural equation modeling (SEM) was utilized to examine the relationships among the constructs of the proposed framework. SmartPLS 3 software was used to conduct the statistical analysis. The first phase of the analysis was to assess the measurements' validity and reliability. The second stage was the structural model analysis to examine the suggested relationships (paths) of the research's framework.

Measurement Model

In the measurement model analysis, the reliability procedures are conducted by evaluating the individual item reliability and the constructs' composite reliability (Wong, 2013). The individual item reliability is evaluated by the significance of individual items' loadings. The loading of each individual item on its underlying construct should be ≥ 0.707 , whereas the composite reliability (CR) and Cronbach Alpha (α) of each construct should be ≥ 0.7 (Koufteros, 1999). As is demonstrated in Table 3, the loadings of all items on their theoretical constructs were ≥ 0.707 . In addition, the values of CR and α for each construct were all ≥ 0.7 .

Table 3

The Measurement Model Analysis (n=228)

Construct	Item	Loading	CR	α
Self-management of learning (SML)	SML1	0.84	0.92	0.89
	SML2	0.88		
	SML3	0.87		
	SML4	0.86		
Perceived Enjoyment (PEN)	PEN1	0.90	0.92	0.88
	PEN2	0.88		
	PEN3	0.86		
	PEN4	0.79		
Relative Advantage (RAD)	RAD1	0.88	0.94	0.92
	RAD2	0.90		
	RAD3	0.91		
	RAD4	0.89		
Social Influence (SIN)	SIN1	0.93	0.95	0.93
	SIN2	0.92		
	SIN3	0.91		
	SIN4	0.89		
Facilitating Conditions (FCO)	FCO1	0.81	0.87	0.80
	FCO2	0.80		
	FCO3	0.82		
	FCO4	0.75		
Complexity (COM)	COM1	0.76	0.89	0.84
	COM2	0.89		
	COM3	0.83		
	COM4	0.79		
Behavioural Intention (BEI)	BI1	0.95	0.96	0.94
	BI2	0.94		
	BI3	0.93		

The validity procedures are included in terms of convergent and discriminant validity. Based on Hair, Sarstedt, and Ringle (2012), convergent validity was evaluated by assessing the values of the average variance extracted (AVE) for each construct. In order to claim the questionnaire has convergent validity, the AVE values of each construct should be ≥ 0.5 . Table 4 demonstrates that all AVE values for each construct was ≥ 0.5 . Discriminant validity was evaluated by comparing the average variance extracted (AVE) with the squared correlation between constructs. Hair, Hult, and Ringle (2013) explain that the values of AVE should be higher than the squared correlation of a construct and that of other constructs in the model. Table 4 indicates that the previous condition has been met by all constructs.

Table 4

Discriminant Validity Analysis

	AVE	BEI	COM	FCO	PEN	RAD	SLM	SIN
BEI	0.88	1						
COM	0.70	0.6 (0.36)	1					
FCO	0.63	0.54 (0.29)	0.27 (0.07)	1				
PEN	0.75	0.44 (0.19)	0.20 (0.04)	0.54 (0.29)	1			
RAV	0.81	0.67 (0.44)	0.66 (0.43)	0.36 (0.12)	0.21 (0.04)	1		
SLM	0.75	0.65 (0.42)	-0.44 (0.19)	-0.31 (0.09)	-0.28 (0.07)	-0.63 (0.39)	1	
SIN	0.83	0.51 (0.26)	0.64 (0.40)	0.24 (0.05)	0.08 (0.01)	0.62 (0.38)	-0.40 (0.16)	1

*Note. Correlation in bold, () =squared correlation

Structural Model

Once the validity and reliability of the measurement model was determined, the next stage was to evaluate the suggested structural paths. In particular, in this step, the values of explanatory power (R^2) and path (regression) coefficients (β) of the proposed framework were identified. As illustrated in Figure 2, the six independent variables explained 68% ($R^2=0.68$) of the variance in the dependent variable BEI. According to the path analysis, RAD ($\beta=0.17$), COM ($\beta=0.2$), FCO ($\beta=0.23$), PEN ($\beta=0.15$) and SIN ($\beta=0.1$) had significant positive effects on BEI, and thus they acted as factors that facilitate the use of m-learning. On the other hand, SML ($\beta= - 0.3$) had a significant negative effect on BEI, and therefore it was considered as the only obstacle towards the use of m-learning.

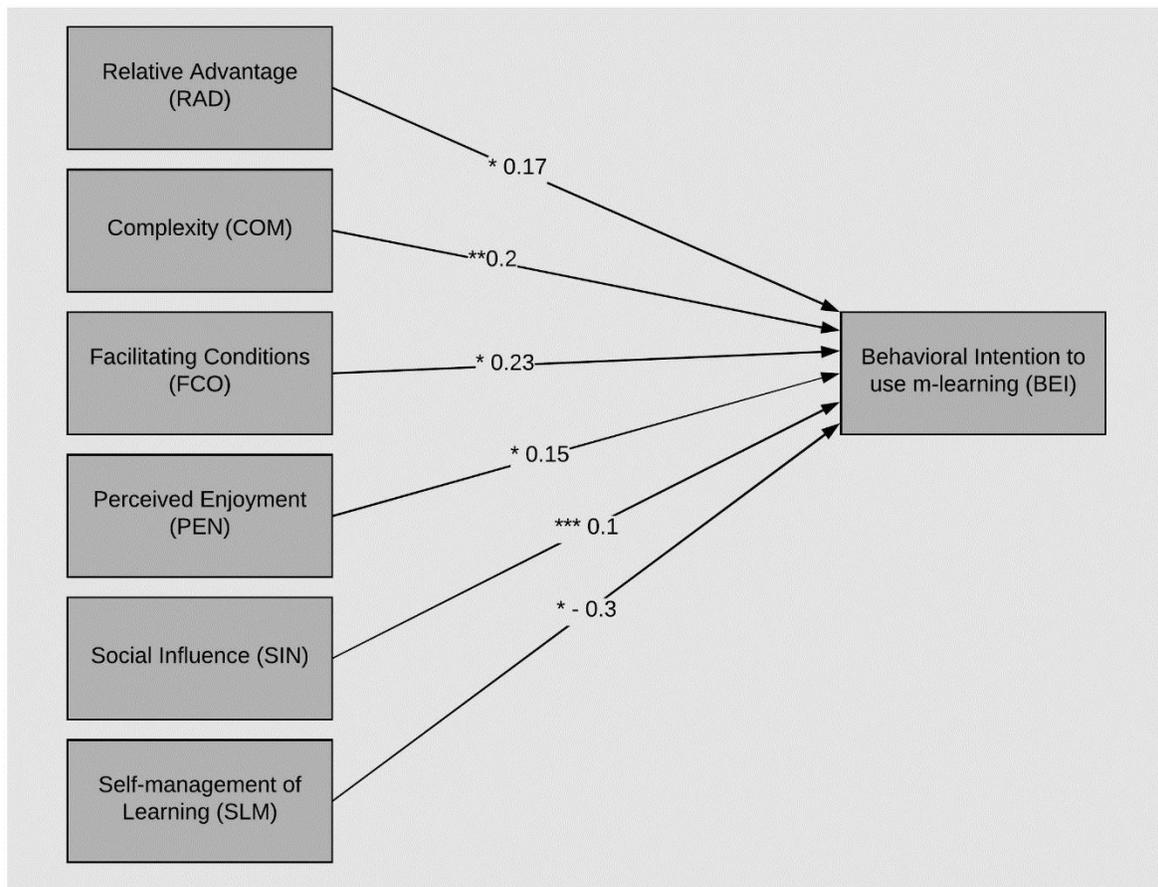


Figure 2. Structural equation modeling results.

*Note. *p value <0.0001, ** p value < 0.001, *** p value <0.01

Moderating Effects

Multi-group analysis was employed to examine the moderating effects of age, gender, and course groups. All moderators were categorical in the questionnaire form. The total sample was split into desired sub-groups and then the path coefficients of the main model were re-calculated for each sub-group. Based on Carte and Russell (2003) criteria of multi-group analysis, the sub-groups of age and course had to be refined because of the sample size of sub-groups of these moderators were too small to conduct multi-group analysis. Therefore, in the case of age, to the age sub-groups of 20-27 (n=89) and >27 (n=43) has been merged to form one group labeled as >20 (n=132), while the age sub-group of <20 (n=96) remained without any refinement. In the case of course, the course sub-groups of education (n=14), business administration (n=32), translation and languages (n=34), and finance and accounting (n=39) were emerged into one group labelled as other courses (n=123), the course sub-group of "IT related" (n=105) remained without any refinement. The t-test approach of Sarstedt, Henseler, and Ringle (2011) was used to determine the significant differences between path coefficients. As Table 5 demonstrates, gender and

age had no significant moderating effects on the model's relationships. On the other hand, there were two significant differences between course groups specifically in terms of the relationship between COM → BEI and FCO→BEI. It was found that perceived complexity (COM) of m-learning was more salient ($\beta = 0.23$) for students who study courses (education, business administration, finance and accounting, translation, and languages) other than student who study IT related courses ($\beta = 0.14$). Similarly, it was found that perceived facilitating conditions (FCO) was more important ($\beta = 0.27$) for students who study courses other than IT related courses ($\beta = 0.16$).

Table 5

Moderating Effects

Structural relation		Model 1 (main effect n=228)	Model 2 (Male, n=137)	Model 3 (Female, n=91)	t-test
Gender	RAD→BEI	$\beta = 0.17$	$\beta = 0.20$	$\beta = 0.16$	1.14 ^{n.s}
	COM→BEI	$\beta = 0.2$	$\beta = 0.18$	$\beta = 0.21$	1.02 ^{n.s}
	FCO→BEI	$\beta = 0.23$	$\beta = 0.21$	$\beta = 0.22$	0.11 ^{n.s}
	PEN→BEI	$\beta = 0.15$	$\beta = 0.17$	$\beta = 0.18$	0.09 ^{n.s}
	SIN→BEI	$\beta = 0.1$	$\beta = 0.13$	$\beta = 0.15$	0.94 ^{n.s}
	SLM→BEI	$\beta = -0.3$	$\beta = -0.31$	$\beta = -0.28$	1.22 ^{n.s}
Structural relation		Model 1 (main effect n=228)	Model 2 (<20, n=96)	Model 3 (>20, n=132)	t-test
Age	RAD→BEI	$\beta = 0.17$	$\beta = 0.21$	$\beta = 0.16$	1.33 ^{n.s}
	COM→BEI	$\beta = 0.2$	$\beta = 0.19$	$\beta = 0.22$	1.27 ^{n.s}
	FCO→BEI	$\beta = 0.23$	$\beta = 0.25$	$\beta = 0.22$	0.83 ^{n.s}
	PEN→BEI	$\beta = 0.15$	$\beta = 0.18$	$\beta = 0.11$	0.08 ^{n.s}
	SIN→BEI	$\beta = 0.1$	$\beta = 0.09$	$\beta = 0.11$	0.91 ^{n.s}
	SLM→BEI	$\beta = -0.3$	$\beta = -0.32$	$\beta = -0.29$	1.31 ^{n.s}
Structural relation		Model 1 (main effect n=228)	Model 2 (IT related, n=105)	Model 3 (other courses, n=123)	t-test
Course	RAD→BEI	$\beta = 0.17$	$\beta = 0.19$	$\beta = 0.22$	1.27 ^{n.s}
	COM→BEI	$\beta = 0.2$	$\beta = 0.14$	$\beta = 0.23$	2.62 ^s
	FCO→BEI	$\beta = 0.23$	$\beta = 0.16$	$\beta = 0.27$	3.32 ^s
	PEN→BEI	$\beta = 0.15$	$\beta = 0.11$	$\beta = 0.13$	0.06 ^{n.s}
	SIN→BEI	$\beta = 0.1$	$\beta = 0.15$	$\beta = 0.12$	0.73 ^{n.s}
	SLM→BEI	$\beta = -0.3$	$\beta = -0.33$	$\beta = -0.31$	0.89 ^{n.s}

*Note. n.s = not significant, s= significant

Discussion and Implications

The main purpose of this study was mainly to explore the factors that may influence students' intentions to use m-learning in the context of higher education. In agreement with Mtebe and Raisamo (2014) and Masrek (2015), relative advantage (RAD) is recognized as a key facilitator of m-learning adoption. When the usefulness of m-learning is increased as a tool to enhance performance, students will be more inclined to use m-learning. This result highlights students' high expectations with regard to enhancing their performance when they use m-learning. It is vital that m-learning providers and lecturers educate students about the significant benefits of m-learning. Moreover, m-learning developers are advised to focus their efforts on designing meaningful and customized applications that directly meet students' needs and increase their performance.

Similarly, in line with Wang et al. (2009) and Abu-Al-Aish and Love (2013), the results demonstrate that complexity (COM) (similar to effort expectancy) has a significant positive influence on m-learning

adoption. The items used to measure the complexity construct focused on the level of difficulty when it comes to using m-learning. The more students perceive m-learning as being easy to use, the more likely they are to utilize it in their learning. The use of mobile devices, especially smart phones, among students of Jordanian universities is very popular. Due to the fact that the use of mobile devices seems to be a routine for most of students, they may perceive that using such devices for learning will not require much effort. However, m-learning developers should take into account the need to design applications with intuitive and user-friendly interfaces.

Although the construct of the self-management of learning (SML) is not extensively examined in the context of m-learning, the results show that this construct is applicable in shaping students' intentions to adopt m-learning. The results indicate that the self-management of learning is a significant obstacle as it has a negative effect on m-learning adoption. Such a finding is in line with those of Al-Adwan, Al-Adwan, and Berger (2018), Yang (2013), and Masrek (2015), but opposed to that of Liew, Kang, Yoo, and You (2013) and Wang et al. (2009). In fact, in this study, SML is found to be the strongest predictor compared to other constructs. Such a finding implies that students who possess highly autonomous learning abilities will be more keen to use m-learning than those with low autonomous learning abilities. This may refer to the educational culture in Jordan where educators are still viewed by students the major source of their learning and subsequently well-structured learning environments (i.e., classrooms) are still favorable for students. A study conducted by Al-Adwan and Smedley (2012) concludes that Jordanian students' lack self-motivation to learn is considered one of the main obstacles toward e-learning adoption. The study found that the lack of self-motivation to learn is linked to students' beliefs that educators are the key source of learning and information and thus students prefer physical communication with their educators. Given this result, the developers of m-learning applications should design applications that are equipped with features that take into account the needs and requirements of students who are highly independent in their learning. On the other hand, educators and administrators should respond by training and encouraging students to be more independent in their learning processes.

Supported by Iqbal and Qureshi (2012), and Hadi and Kishik (2014), the results also suggest that the construct of facilitating conditions (FCO) is a significant enabler of m-learning adoption. This finding hints that the absence of facilitating conditions will affect students' intentions to use m-learning. Accordingly, m-learning providers should provide students with technical support and training courses to facilitate their interaction with m-learning applications. Additionally, m-learning providers are required to ensure the availability of free and adequate wireless networks in universities. Offering discount vouchers on different types of mobile devices would also encourage and facilitate students' engagement with m-learning. Likewise, the government could play an important role in m-learning by providing public places such as restaurants and public libraries with convenient and suitable internet access for students. This finding also alerts authorities by highlighting the importance of the continuity of updating the infrastructure required for the implementation of m-learning.

The results reveal that social influence (SIN) is found as another facilitator of m-learning adoption. In this study SIN found to be the weakest predictor compared to other constructs. This finding is consistent with those of Nassuora (2013) and Abu-Al-Aish and Love (2013), but contrary to the findings of Jambulingam (2013). According to this finding it can be concluded that students' desire to engage with m-learning is

markedly increased when they are encouraged and advised by individuals who are important to them such as faculty and peers. Based on this finding, faculty members should encourage and help students to realize the benefits of m-learning. Furthermore, peers can have a significant role in promoting m-learning to other students. In particular, early adopters of m-learning can be employed as an effective tool to convince other students to use m-learning.

In agreement with Ali and Arshad (2016) and Poong Yamaguchi, and Takada (2016), perceived enjoyment is found to have a positive influence on m-learning adoption. This finding demonstrates that the more students enjoy m-learning, the more they will be encouraged to become involved in m-learning activities. Wang et al. (2009) point out that developing enjoyable and playful m-learning is crucial for attracting large numbers of users with diversified backgrounds. Consequently, such a result should alert m-learning developers' attention to the significance of enriching their applications with entertaining and pleasurable features.

In contrary with Hassan, Nawaz, Syed, Arfeen, Naseem, and Noor (2015) and Wang et al. (2009), this concludes that age and gender has no moderating effects on the structural relationships. On the other hand, two moderating effects of course type have been identified. Specifically, course type moderated the relationship between complexity, facilitating conditions, and behavioral intention to adopt m-learning (COM → BEI and FCO→BEI). Course type had two sub-groups: IT related and other courses. The results suggest that the perceived complexity and facilitating conditions are more important for students who do not study IT related courses. This may be justified by the fact that the students of IT related courses possess higher computer literacy and IT skills due to the nature of IT courses they study (i.e., computer science and programming). Such result suggest that m-learning providers should offer constant technical support and training courses for students who study courses other than IT related courses in order to increase m-learning literacy and knowledge. Furthermore, m-learning developers should clarify how students from different courses use and interact with m-learning systems. Identifying the frequency of use and the degree of complexity of tasks performed with m-learning systems may help developers customizing m-learning systems to efficiently meet students' needs from different courses.

Conclusion and Future Work

The main goal of this study has been to explore factors that influence students' behavioural intentions to adopt m-learning. To address this goal, an empirical framework drawn from several technology acceptance models has been proposed. The results of analyzing the collected data indicate that the proposed model explained 68% of the variance in students' behavioural intentions to adopt m-learning. The findings demonstrate that relative advantage, complexity, social influence, facilitating conditions, and perceived enjoyment represent key facilitators to m-learning. On the other hand, self-management of learning is considered as a key inhibitor in terms of the adoption of m-learning. This study has useful implications for m-learning providers and developers. M-learning developers should design effortless applications that are compatible with students' needs. Additionally, they should offer applications that make a difference when they are compared with previous learning styles and tools. Students are expected to recognize the benefits of m-learning on their overall learning performance. M-learning providers and

educators should encourage and promote the use of m-learning. Additionally, senior management should make sure that resources and technical support for m-learning are in place whenever needed by students.

M-learning providers should pay special attention to the negative impact of self-management of learning on m-learning adoption. Addressing the causes of the low level of self-management of learning among students allows senior management to reveal the actual problems associated with the adoption of m-learning. In particular, senior management can utilize the measurement scale which has been used to measure the construct of self-management of learning to uncover the reasons behind students' resistance.

Similar to other studies, this study has several limitations. The sample of this study included students from two universities. Future studies may extend the sample population by including students of other universities. This study aimed at investigating students' behavioural intentions with regard to adopting m-learning. Further studies are needed to examine the actual use of m-learning among higher education students. In social science research, while quantitative research has several strengths, various criticisms are associated to quantitative methods (Al Adwan, 2017). Thus, since this study is based on questionnaire survey-based method, additional studies with mixed method approach (qualitative and quantitative) are required to provide a holistic understanding of m-learning adoption.

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What Research Says About MOOCs – An Explorative Content Analysis



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Abstract

Since the first offering of a Massive Open Online Course (MOOC) in 2008, the body of literature on this new phenomenon of open learning has grown tremendously. In this regard, this article intends to identify and map patterns in research on MOOCs by reviewing 362 empirical articles published in peer-reviewed journals from 2008 to 2015. For the purposes of this study, a text-mining tool was used to analyse the content of the published research journal articles and to reveal the major themes and concepts covered in the publications. The findings reveal that the MOOC literature generally focuses on four lines of research: (a) the potential and challenges of MOOCs for universities; (b) MOOC platforms; (c) learners and content in MOOCs; and (d) the quality of MOOCs and instructional design issues. Prospective researchers may use these results to gain an overview of this emerging field, as well as to explore potential research directions.

Keywords: distance education, open and distance learning, massive open online courses, MOOCs, content analysis

Introduction

The 21st century witnessed an educational paradigm shift, stemming from the widespread use of Information and Communication Technologies (ICT). With the proliferation of ICT, online, open, and flexible learning moved from the periphery to mainstream education. ICT improved the quality and capacity of the online delivery of educational content. Online networks are used as learning spaces that are distributed, flexible, accessible, and, most importantly, potentially open. Openness in education has evolved over time and has emerged in different forms (Weller, 2014): It is suggested

that “there are three key strands that lead to the current set of open education core concepts: open access education, open source software and web 2.0 culture” (p. 34). Providing access to higher learning opportunities is the *raison d'être* of Open Universities (Tait, 2008). Massive Open Online Courses (MOOCs) are a recent development of this open learning movement, which have drawn much attention from both the academic and the public sphere. The first course in this format was offered in 2008 at the University of Manitoba and was entitled *Connectivism and Connective Knowledge* (Liyanagunawardena, Adams, & Williams, 2013).

MOOCs are not an independent phenomenon, isolated from other developments in the field of open and distance learning or educational technology. On the contrary, MOOCs are strongly tied to other developments in the field, having the potential to support lifelong learning, eliminate barriers in the learning process, provide equality of opportunity in education, and, most importantly, ensure the liberalization of knowledge.

MOOCs are a new and emerging, rapidly evolving field of practice and research. The body of literature about MOOCs has grown extremely rich. This article builds upon a previous study that investigated general publication and authorship patterns, research areas, and applied methods in MOOC research (see Bozkurt, Akgün-Özbek, & Zawacki-Richter, 2017). In light of this dynamic development, the aim of this study is to explore and to provide an overview of the key themes covered in MOOC research publications from 2008 to 2015 with the text-mining tool Leximancer™. The results provide a structure of themes and topics in MOOC research, which can be used to develop new research questions to be investigated in more in-depth content analysis, for example by means of systematic review (see Gough, Oliver, & Thomas, 2012).

Literature Review

A MOOC is defined as open, participatory, distributed, and as supporting lifelong network learning (Cormier, 2010). The first MOOC, belonging to the first generation, was given by George Siemens and Stephen Downes in 2008 (Downes, 2012). The success of first-generation connectivist MOOCs inspired other researchers; Sebastian Thrun and Peter Norvig gave the first extended MOOC in 2011, which belongs to the second generation (Martin, 2012). To differentiate between these two types of MOOCs, they were then called cMOOCs and xMOOCs respectively (Downes, 2012). The success of the first and second-generation MOOCs raised a lot interest in the public sphere, in academia, and in higher education institutions. This led to the innovative experimental idea of hybrid MOOCs, first delivered by a group of academics from the University of Edinburgh in 2013 (Roberts, Waite, Lovegrove, & Mackness, 2013; Waite, Mackness, Roberts, & Lovegrove, 2013; Ross, Sinclair, Knox, & Macleod, 2014; Bozkurt, Kilgore, & Crosslin, 2018).

Whilst the letters in the MOOC acronym represent one basic form (Diaz, Brown, & Pelletier, 2013), there are two different MOOC types according to the pedagogical approach they employ (Rodriguez, 2012). The first-generation cMOOCs embraced a decentralized, learner-centred approach; the second-generation xMOOCs were characterized by teacher-centred teaching and learning; the third-generation hybrid MOOCs took a more pragmatic approach by combining the two previous approaches; to diversify learning opportunities and to reach a broader audience.

There have been some efforts in academia to understand and analyse the MOOC phenomenon; several papers have examined MOOC research in academic journals (Ebben & Murphy, 2014; Gasevic, Kovanovic, Joksimovic, & Siemens, 2014; Kennedy, 2014; Liyanagunawardena et al., 2013; Raffaghelli, Cucchiara, & Persico, 2015; Sa'don, Alias, & Ohshima, 2014; Sangrà, González-Sanmamed, & Anderson, 2015; Veletsianos & Shepherdson, 2015, 2016; Bozkurt, Akgün-Özbek, & Zawacki-Richter, 2017). These papers examined aspects of MOOC research such as methodology, pedagogy, and theory. Furthermore, Bozkurt, Özdamar Keskin, and de Waard (2016) investigated theses and dissertations on MOOCs, focusing on methodological and theoretical issues, and representing MOOCs with a Gartner hype cycle.

Other papers have investigated MOOCs in the fields of broadcasting and social media (Bulfin, Pangrazio, & Selwyn, 2014; Deimann, 2015; Kovanovic, Joksimovic, Gasevic, Siemens, & Hatala, 2015; Shen & Kuo, 2015), taking a closer look at the phenomenon by focusing on discourses and sentiments on MOOCs, as well as identifying influencers in broadcasting and social media. Finally, some papers narrowed their scope in analysing MOOC research. For instance, Ossiannilsson, Altinay, and Altinay (2016) reviewed MOOC research with the aim of identifying factors that affect learner experience and quality issues in MOOCs. Similarly, Saadatdoost, Sim, Jafarkarimi, and Mei Hee (2015) examined MOOC studies from the perspective of education and information systems, and Calonge and Shah (2016) analysed MOOC literature in terms of graduate skills gaps and employability.

Similar to this research, but with a different scope, Chen (2014) identified 306 blog posts related to MOOCs published from January 2010 to June 2013 and analysed them using a text-mining technique. He noted that MOOCs provide many opportunities for learners, faculty members, universities, and MOOC providers. On the other hand, he also identified some challenges that MOOCs need to overcome, such as questionable course quality, high dropout rates, unavailable course credits, ineffective assessments, complex copyright issues, and the lack of necessary hardware required to join MOOCs.

Whilst previous bibliographic studies, literature reviews, and content analyses looked at theoretical, methodological, and pedagogical approaches, or specific aspects of MOOC research (e.g., quality or learner's perceptions), our study aims to provide an overview of the overall structure of themes and topics of research into MOOCs by means of a computer-assisted content analysis using a text-mining tool.

Method and Sample

This paper is a review study in nature. It uses document analysis to collect and identify relevant articles and content analysis using a text-mining tool to identify themes and concepts covered in the publications (Figure 1).

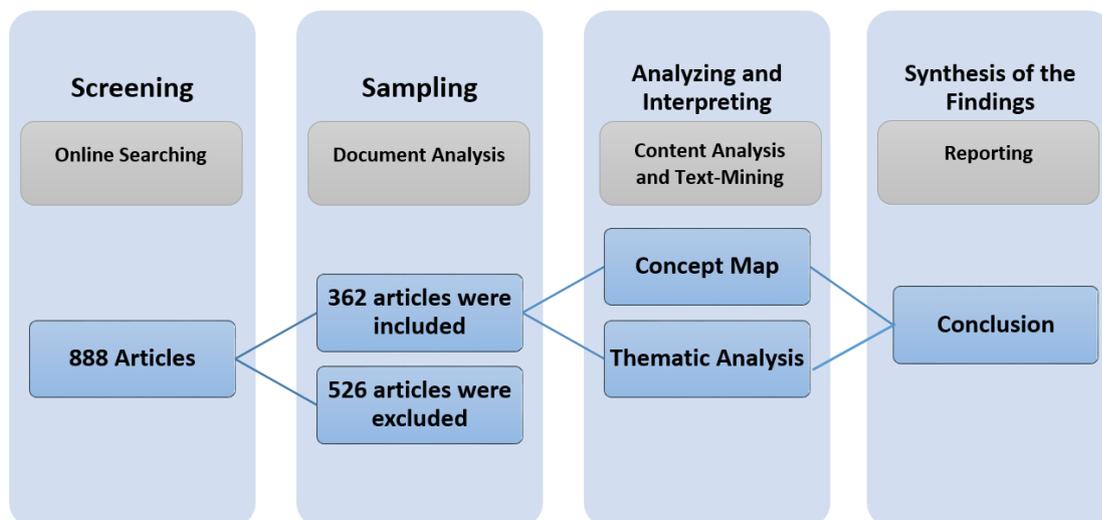


Figure 1. Phases of the research process.

The articles were selected by searching for the following keywords: *MOOC*, *MOOCs*, *Massive Open Online Course*, and *Massive Open Online Courses*. In the initial analysis, it was found that four academic databases provide the most comprehensive search results: EBSCO, ERIC, Google Scholar, and Scopus. A total of 888 papers were collected in the screening process and were analysed using the following inclusion criteria: published in a peer-reviewed journal between 2008 and 2015; written in English; online full-text accessibility; and searched keywords appearing in the title. Accordingly, 526 papers that were irrelevant or did not meet the inclusion criteria were excluded from the sample. Thus, 362 articles that met the criteria formed the corpus for further analysis. Figure 2 provides an overview of the growth and frequency of relevant research articles from 2008 to 2015.

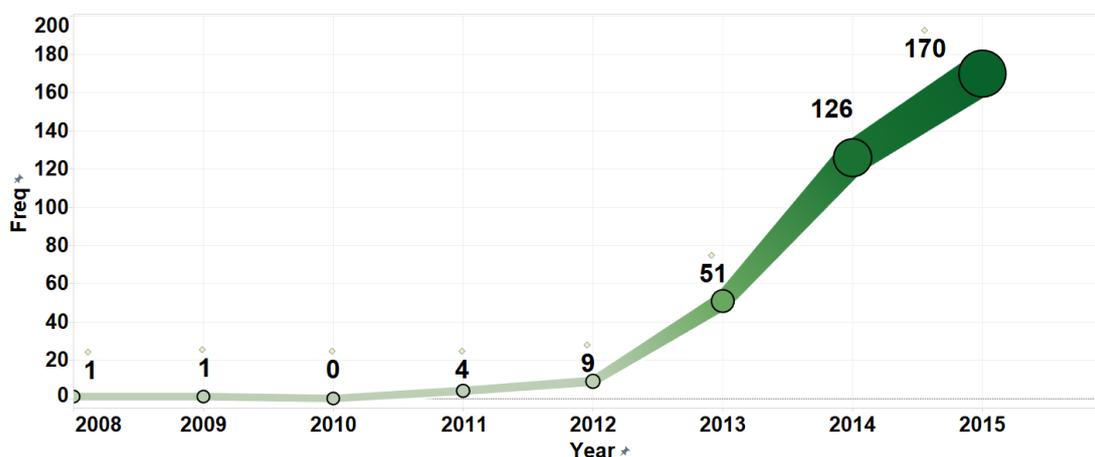


Figure 2. Frequency of the sampled articles by year (N = 362).

Computer-based content analysis enables us to examine the conceptual structure of text-based information, so it can be used to identify the most important and most commonly occurring themes within large bodies of text (Krippendorff, 2013). For the purposes of this study, the software tool Leximancer™ was used to produce a concept map from the titles and abstracts of the 362 journal articles, as the titles and abstracts of peer-reviewed articles are usually lexically dense and focus on the core concepts, themes, and results of the research.

Leximancer™ has previously been used to analyse the content of academic journals such as *Distance Education* (Zawacki-Richter, & Naidu, 2016), the *Journal of Cross-Cultural Psychology* (Cretchley, Rooney, & Gallois, 2010), and the *Journal of Communication* (Lin & Lee, 2012). Moreover, it has been shown that computer-aided content analysis is an appropriate method to map out a research domain (see Fisk, Cherney, Hornsey, & Smith, 2012). The software tool creates so-called concept maps (see Figure 3) that display the core concepts within the text body (conceptual analysis) and show how these concepts are related to each other (relational analysis) by recording the frequency with which words co-occur in the text. Similar concepts that appear in close proximity are clustered together in the concept map (Smith & Humphreys, 2006): “The map is an indicative visualization that presents concept frequency (brightness), total concept connectedness (hierarchical order of appearance), direct inter-concept relative co-occurrence frequency (ray intensity), and total (direct and indirect) inter-concept co-occurrence (proximity)” (p. 264). Depending on the connectedness of concepts, thematic regions are identified, indicated by coloured circles, and named after the most prominent concept in the region.

Limitations

We acknowledge the limitation that the sample selection for the purposes of this content analysis is limited to publications in academic journals in the English language, even though much of the discussion about MOOCs also takes place at conferences and in their proceedings, on blogs, and social media. This choice of methodology was influenced by our aim to explore only fully-fledged research rather than non-evidence-based claims or opinions.

Journal publications are, of course, subject to various influences (Goldenberg & Grigel, 1991):

The most important of these is surely the gatekeeping role of editors, editorial boards, and reviewers of submissions to the journal. Quite aside from what one might prefer to do, publication responds to funding possibilities and publishing possibilities, and these in turn respond to connections and selection of a topic, a method, and a choice of potential journal most likely to lead to publication. (p. 436)

The text-mining tool Leximancer™ has been shown to produce stable and valid results for this kind of content analysis, as in Zawacki-Richter and Naidu (2016), who used this tool to map out research trends from 35 years of publications in the journal *Distance Education*. However, Harwood, Gapp, and Stewart (2015) highlighted that:

Leximancer is not a panacea, it still requires analytical sensitivity and judgment in its interpretation, but it is straightforward to probe the data and cross-check via the resultant maps. [...] Leximancer enables the analyst to make sense of large narrative data sets with minimal manual coding. The result is an efficient and impartial second opinion on open codes (concepts, categories and dimensions) and potential links between them. (p. 1041)

Thus, the generated concept maps require careful interpretation in light of exhaustive and profound knowledge of the subject matter under investigation.

Findings and Discussion

The concept map in Figure 3 depicts the major topics covered in the selected MOOC articles published between 2008 and 2015. The thematic summary includes a connectivity score to indicate the relative importance of the themes. The results reveal that the thematic region of *courses* has the most direct mentions within the text (i.e., titles and abstracts) with 599 (100% relative count), followed by *MOOC / Massive Open Online Courses* (83%), *learners* (23%), *design* (10%), *analysis* (9%), *future* (7%), and *universities* (6%). The following table provides an overview of the concepts in terms of their relative relevance in the concept map (see Figure 3).

Table 1

Ranked Concept List

Concept	Count	Relevance	Concept	Count	Relevance
courses	599	100%	challenges	46	8%
MOOC	497	83%	access	44	7%
online	468	78%	experience	44	7%
open	415	69%	potential	42	7%
education	366	61%	content	42	7%
learning	249	42%	future	40	7%
students	190	32%	approach	39	7%
learners	135	23%	world	39	7%
study	104	17%	time	37	6%
use	99	17%	results	36	6%
model	81	14%	provide	35	6%
research	70	12%	universities	35	6%
development	70	12%	literature	34	6%
quality	63	11%	information	34	6%
teaching	59	10%	platforms	33	6%
design	58	10%	pedagogical	32	5%
participants	56	9%	based	32	5%
different	56	9%	discussion	31	5%
analysis	53	9%	virtual	23	4%
data	49	8%			

In this section, the results of the text-mining analysis are described along four connected pathways that emerged from the selected MOOC articles: (a) the potential and challenges of MOOCs for universities; (b) MOOC platforms; (c) learners and content in MOOCs; and (d) the quality of MOOCs and instructional design issues. The selection of these four major research content areas in the MOOC literature is based on a qualitative interpretation of the central concepts (see Table 1) that are linked via the thematic regions in the overall concept map. In the following discussion, representative studies are chosen to illustrate the most prevalent research topics and themes covered in the publications.

work; (b) having a sense of speaking into a vacuum due to the absence of immediate feedback from students; (c) being burdened by the heavy demands of time and money; and (d) encountering a lack of student participation in online forums.

Other papers address the topic of licensing and intellectual property from the perspective of academic librarians (e.g., Mune, 2015; Gore, 2014). The business models on which MOOCs are based are important for their sustainability; Porter (2015) describes various models that are used by MOOC platforms and providers (“MOOconomics”) and finds that most MOOCs are currently based on a freemium model, in which “a certain amount of a product is available to all, freely, whilst other parts of the product are charged for” (p. 57).

MOOC Platforms

The concepts *MOOC* and *platforms* are directly connected in the concept map (see concept path: *MOOC–Massive Open Online Courses–platforms*). This pattern is related to the popularity of xMOOCs, which are provided through learning platforms, as opposed to cMOOCs, which are provided in online, distributed, networked learning spaces.

Whilst Coursera, edX, and Udacity are the most established MOOC platforms, supporting very large numbers of learners, Ahn, Butler, Alam, and Webster (2013) explore alternative platforms “that promote more participatory modes of education production and delivery” (p. 160). They describe the platform of the Peer 2 Peer University, which invites any user to design and develop their own courses that can be taken by any other member of the community. The study explores how learners participated and engaged with online learning and course development using log data from the platform.

Other authors discuss MOOC platforms within specific content domains or national and cultural contexts; for instance, the Hasso Plattner Institute in Germany created the OpenHPI platform for special courses in information technology with a web tool for interactive software experiments (Neuhaus, Feinbube, & Polze, 2014). Adham and Lundqvist (2015) give an overview of Arab initiatives in the Middle East to launch their own country-specific MOOC platforms, such as Edraak in Jordan, Rwaq in Saudi Arabia, or MenaVersity in Lebanon. SkillAcademy, launched 2013 in Egypt, offers over 10,000 online courses at no cost. With regard to gender segregation in those countries, especially in Saudi Arabia, the authors believe that

MOOCs can help remove these cultural and social limitations and, that the social aspect should not be neglected. MOOCs can enable freedom of expression for women so they can communicate in a real world setting (mixed gender classes) meeting and interacting with others. (p. 134)

Finally, the institutional integration of MOOC platforms in the larger context of the digital learning and teaching infrastructure is an important topic. For example, Rocio, Coelho, Caeiro, Nicolau and Teixeira (2015) report on an open course on climate change at Universidade Aberta in Portugal, which was the largest MOOC course delivered in Portuguese. For this project, a technological solution was implemented to integrate the institutions open learning management system Moodle with open social software (Elgg).

Learners and Content in MOOCs

In order to produce effective learning experiences with quality learning materials, the analysis of learner characteristics and profiles is the starting point in the instructional design process (Morrison, Ross, Kalman, & Kemp, 2011; Stöter, Bullen, Zawacki-Richter, & von Prümmer, 2014). It is therefore not surprising that the concept path *students–MOOC–learners–content* forms a central backbone in the concept map.

The evaluation of student perceptions plays an important role in the course development process and the quality of e-learning in general. Regarding the evaluation of MOOCs, Li, Zhang, Bonk, and Guo (2015) integrated a MOOC into a traditional undergraduate course at a Chinese university and evaluated the perceived ease of use of the course environment, perceived interaction with peers, and overall learner satisfaction in order to derive suggestions on how to improve the course design. Zutshi, O’Hare, and Rodafinos (2013) examined student experiences with MOOCs through a content analysis of blog posts: “Results provided a glimpse of the student experiences, including why students take such courses, what elements of their experience are positive, and what can be improved from the student point of view” (p. 218).

Daza, Makriyannis, and Rovira Riera (2013) point out that, in open courses that are offered to thousands of students, it is very difficult to harmonize the different backgrounds of the participants given the diverse range of their prior knowledge, particularly with regard to mathematics. Phan, McNeil, and Robin (2016) investigated the association between learners’ motivation for engagement, their prior knowledge, and course performance. Student motivation and its effects on course performance and completion are also investigated in several other studies (e.g., Stevanovic, 2014; Yang, 2014). Greene, Oswald, and Pomerantz (2015) found that “learners” expected investment, including level of commitment, expected number of hours devoted to the MOOC, and intention to obtain a certificate” (p. 925) are predictors of retention and achievement in MOOCs.

Online interaction patterns are a very prominent area of research in online and distance education (see Zawacki-Richter, & Anderson, 2014; Zawacki-Richter, Bäcker, & Vogt, 2009), and this issue is covered in several of the selected MOOC articles. For example, Gillani and Eynon (2014) used social network analysis to reveal when and how students interacted with one another and studied the relationship between forum participation and performance in terms of final marks. Clinnin (2014) also focused on interaction in discussion forums to understand how students presented their identities in forming learning communities.

Based on learners’ needs and the content to be covered in a course, the development and reuse of learning materials in MOOCs are important topics in the analysed articles, and this is where open educational resources (OER) become a prominent issue. Atenas (2015) makes the point that, as “taxpayers are funding the development of these open and massive courses, access to the resources should be considered a right for all citizens who are interested in increasing their knowledge and improving their skills” (p. 10). In a more technical paper in the field of computer science, Piedra, Chicaiza, López, and Tovar (2015) propose an architecture and model for searching for OER for use in MOOCs. On the other hand, content creation has to be funded somehow, and the use and reuse of learning materials is part of the protected business model of the largest MOOC providers. Coursera, Udacity, EdX, and Future Learn have strict regulations in their terms and conditions that prohibit the

reproduction, duplication, or redesign of any of their content. This is a major problem from the point of view of the Open Education Movement (Atenas, 2015).

Quality of MOOCs and Instructional Design Issues

The discussion about the quality of MOOCs is directly linked to research related to instructional design (see concept path: *MOOC–study–quality–pedagogical–design*) as evaluation and quality assurance is an integral part of the instructional design process (see Morrison et al., 2011). Around 2014, the first systematic MOOC quality assurance initiatives began to emerge; for example, Read and Rodrigo (2014) presented a quality model for MOOCs at UNED, the Spanish distance teaching university. In the *European Excellence E-Learning Quality Project*, Rosewell and Jansen (2014) developed a quality label based on benchmarks for MOOCs derived from the E-xcellence label; an instrument for assessing the quality of e-learning in higher education. The *European Foundation for Quality in E-Learning* (EFQUEL) has also developed a special framework for the quality assurance of MOOCs (Creelman, Ehlers, & Ossiannilsson, 2014).

In contrast to these general quality frameworks, other authors elaborate in more detail on indicators of pedagogical or instructional quality. For example, in the context of teacher training, Aleman de la Garza, Sancho Vinuesa, and Gomez Zermeño (2015) administered a questionnaire with a set of indicators related to pedagogical, functional, technological, and time factors, in order to assess the quality of a MOOC on educational leadership with over 10,000 participants. Margaryan, Bianco, and Littlejohn (2015) compared and assessed the instructional design quality of xMOOCs and cMOOCs, concluding that “most MOOCs are well-packaged; [but] their instructional design quality is low” (p. 77). Admiraal, Huisman, and Van de Ven (2014) expressed particular concerns about the quality of self- and peer assessment in MOOCs. In a comparison of three MOOCs with 98,071 participants, they conclude that the quality of self- and peer assessment was only low to moderate, and that “both self-assessment and peer assessment should be used as assessment for learning instead of assessment of learning” (Admiraal, Huisman, & Van de Ven, 2014, p. 119).

Conclusion and Future Directions

This study provides an overview of the current state of research on MOOCs by analysing the titles and abstracts of publications in academic journals with a text-mining tool, in order to determine the prevailing themes and concepts in the MOOC studies. The research areas covered in these articles can be described along four major lines: (a) the potential and challenges of MOOCs for universities; (b) MOOC platforms; (c) learners and content in MOOCs; and (d) the quality of MOOCs and instructional design issues. These four broad research areas alternate between issues related to the institutional macro/meso level (opportunities and challenges of MOOCs for educational institutions, technological infrastructure, and platforms) and the micro level of teaching and learning in MOOCs (learner characteristics, content development, quality assurance, and instructional design). Zawacki-Richter and Naidu (2016) found a similar pattern of research in the last 35 years in the broader field of open, distance, and flexible learning.

MOOCs are but a new form of the open education phenomenon (cf. Weller, 2014); the content analysis revealed that *open access* to courses is a central theme in the publications. Open education should be open with regard to people, places, and methods. Online curriculum and course development,

instructional design, quality assurance, student and faculty support, technological platforms, and infrastructure are – among other things – important issues to consider, not only in the context of MOOCs, but in open, online, and distance learning in general. Therefore, it is important to build upon the theory, research, and practice in the broader field of open, distance, and flexible learning, in order to prevent the research community reinventing the wheel.

Of course there are aspects that are unique to MOOCs, for example the obvious challenge to support and help very large numbers of students to succeed and to avoid dramatic drop-out rates. As Admiraal et al. (2014) discussed, carefully designed opportunities for peer support as well as self and peer assessment *for* learning (rather than assessment *of* learning) might be part of the solution, however more research is needed in this area.

In contrast, many MOOCs follow an instructional approach that leads to expository teaching and passive learning with poor student support. Research in the field of distance education has shown that student support and personal interaction, independent of time and space, is a critical factor in providing high quality learning opportunities. As the majority of MOOCs are organized as a series of video-based web-lectures, they can be compared with the development of video-conferencing in distance education in the 1990s. During this time, Daniel (1998) talked about a triple crisis of access, cost, and flexibility in a passionate keynote at a conference of satellite video-conferencing providers in the US:

Group teaching in front of remote TV screens? This is not only an awful way to undertake distance learning, but flies in the face of everything that we have learned while conducting successful open and supported learning on a massive scale for the past 27 years. Our lessons are the key to addressing the triple crisis of access, cost and flexibility now facing higher education world-wide. (p. 21)

Daniel criticized the synchronous mode of delivery in particular, which limits access and flexibility, but he also criticized video-conferencing as a very teacher-centred form of instruction. Given the huge demand for open access courses, Daniel's remarks about access, flexibility, and costs in higher education are obviously still relevant.

Furthermore, the evaluation of MOOCs and quality assurance is a very prominent and relevant topic in the publications. Rather than developing new quality frameworks for MOOCs from scratch, it is recommended to build upon quality models and instruments that were developed to measure the quality of multimedia applications, learning objects, and open educational resources (see Yuan & Recker, 2015).

After this first wave of MOOC hysteria, research and practice should focus on how best to harness the enormous opportunities that MOOCs might afford for providing access to knowledge and education, whilst equally addressing problematic issues like high dropout rates and the development of sustainable cost models. Major lessons learnt from the field of open, distance, and flexible learning (see Zawacki-Richter & Anderson, 2014), especially in the area of student support, instructional design, and quality assurance, should be kept in mind whilst moving forward.

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Pilot Testing for Feasibility in a Study of Student Retention and Attrition in Online Undergraduate Programs



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*Pilot studies are "underdiscussed, underused, and underreported."
(Prescott & Soeken, 1989, p.60)*

Abstract

Prior to undertaking a descriptive study on attrition and retention of students in two online undergraduate health administration and human service programs, a pilot test was conducted to assess the procedures for participant recruitment, usability of the survey questionnaire, and data collection processes. A retention model provided the conceptual framework for this investigation to identify and organize various factors that influenced students' decisions to either discontinue or continue their educational programs. In an attempt to contribute to the body of research in this area and to enrich pedagogical practices, the authors describe the pilot testing processes and feasibility issues explored, and the improvements made to the instrument and methodology before commencing the main research study on attrition and retention.

Keywords: pilot testing, feasibility study, attrition, retention, model, health administration, human service, online, undergraduate, students, distance education

Introduction

Retaining students is both a priority and an unrelenting challenge in higher education, whether in conventional face-to-face settings or in distance education (Tinto, 1975, 1982; Berge & Haung, 2004;

Heyman, 2010; Rintala, Andersson, & Kairamo 2011). Tinto's (1982) analyses of undergraduate degree completion rates from 1880-1980 prompted him to say "rates of dropout from higher education have remained strikingly constant over the past 100 years" (p. 694). He observed that students were dropping out at a rate of 45% with little variation over time. More than three decades after Tinto's study, the problem of retention persists in higher education generally, and is an even greater concern in distance and distributed learning contexts. Indeed, attrition and retention became the focus of concern for an investigation in the Bachelor of Health Administration (HADM) and Human Service (HSRV) programs delivered online at a single open and online university.

As a precursor to the main descriptive study on attrition and retention, a pilot study was conducted to determine the feasibility of using a survey questionnaire and the recruitment and data collection processes. The online survey instrument was structured around a retention model that the researchers had not previously employed. It was believed that the model would provide an effective framework for organizing the factors contributing to students' decisions to either discontinue or continue their online studies.

Historically, pilot and feasibility studies were not usually reported, and nor were they topics of much discussion in the research literature. While to some extent this continues to be the case in educational research, pilot and feasibility studies have recently become the focus of extensive debate in the health-related literature. It would be beneficial if similar attention were given to pilot and feasibility studies in the broader research context, including the education community. In an attempt to contribute to the body of research in this area, the authors describe the pilot testing process, the specific feasibility issues explored, and modifications made to prepare for the main study on attrition and retention in distance education. First, some background information is provided, including a definition of terms; followed by a discussion of the purpose, differences, and similarities of pilot and feasibility studies described in the literature. The definitions and purposes proposed in the health research are relevant to and help inform educational research, and are therefore included in the background discussion in this paper.

Background on Pilot and Feasibility Studies

Definition of Terms

In general, a pilot precedes and is closely related to a larger study (Prescott & Soeken, 1989; Lancaster, Dodd, & Williamson, 2004; Eldridge et al., 2016). A pilot is often viewed synonymously with a "feasibility study intended to guide the planning of a large scale investigation" (Thabane et al., 2010, p. 1). In effect, pilots comprise a risk mitigation strategy to reduce the chance of failure in a larger project.

The word *pilot* has several different meanings in the research literature; however, as Eldridge et al. (2016) point out, definitions of pilot studies usually focus on an experiment, project, or development undertaken in advance of a future wider experiment, project, or development. In other words, a pilot study facilitates decision-making, and therefore serves as "a small-scale experiment or set of observations undertaken to decide how and whether to launch a full-scale project" (Collins English Dictionary, 2014, para 1).

An informal term often used for feasibility is *doability*; Eldridge et al. (2016) observed that outside of the health context, definitions of feasibility and feasibility studies focus on the likelihood of being able to do something easily or conveniently, and on the “assessment of the practicality of a proposed plan or method” (para. 16). Moore, Carter, Nietert, and Stewart (2011) noted that pilot studies imply feasibility to the extent that they are “preparatory studies designed to test the performance characteristics and capabilities of study designs, measures, procedures, recruitment criteria, and operational strategies that are under consideration for use in a subsequent, often larger, study” (p. 332).

There is no clear distinction between *pilots*, *pilot trials*, and *feasibility studies* in the way the terms are used (Thabane et al. 2010). van Teijlingen and Hundley (2002) argued that “[t]he term 'pilot studies' refers to mini versions of a full-scale study (also called 'feasibility' studies), as well as the specific pre-testing of a particular research instrument such as a questionnaire or interview schedule” (p. 1). Bowen et al. (2009) similarly used the term feasibility study “to encompass any sort of study that can help investigators prepare for full-scale research leading to intervention” (p. 453).

Arain, Campbell, Cooper, and Lancaster (2010) do not agree that the terms pilot and feasibility can be used interchangeably; these authors contend that a feasibility study is undertaken to determine important components critical to the development of the main study, whereas a pilot study is the conduct of the main study in miniature. This aligns with others who suggest that due to the specific goals of each, pilot and feasibility studies are mutually exclusive. For example, Bugge et al. (2013) noted that feasibility studies are designed to “ask questions about whether the study can be done” and they agreed that pilot trials are “a miniature version of the main trial, which aim to test aspects of study design and processes for the implementation of a larger main trial in the future” (p. 2).

The numerous, and conflicting definitions and interpretations; differences in current usage, and diverse opinions in the health research community regarding the concepts of pilot and feasibility; motivated Eldridge et al. (2016) to undertake extensive work to clarify the issue. They concluded that rather than viewing pilot and feasibility studies as separate entities, pilot studies are best defined as subsets of feasibility studies; therefore, feasibility is conceptualized as “an overarching concept for studies assessing whether a future study, project or development can be done” (para. 23). This means that all studies aiming to assess “whether a future [randomized control trial] RCT is doable [are defined] as ‘feasibility studies’” (Eldridge et al., 2016, para. 30). Hence, a systematic review or meta-analysis of the research literature could be classified as a feasibility study, but not as a pilot study. Moreover, these authors determined that although “all pilot studies are feasibility studies...not all feasibility studies are pilot studies” (Eldridge et al., 2016, para. 17).

Eldridge’s team (2016) propose that even though a pilot study could ask the same questions as a feasibility study, a pilot has specific design features. Consequently, they noted that:

While piloting is also concerned with whether something can be done and whether and how we should proceed with it, it has a further dimension; piloting is implementing something, or part of something, in a way you intend to do it in future to see whether it can be done in practice (para. 17).

Purpose of Pilot and Feasibility Studies

Pilot studies. In research textbooks from the 1980s, the purported purpose of pilot studies was generally only to test, on a small scale, the steps outlined in a previously-developed research plan, and then based on the results of the pilot, revisions would subsequently be made to the plan (Ackerman, & Lohnes, 1981; Brink & Wood, 1983; Burns & Grove, 1987; Lieswiadomy, 1987; Polit & Hungler, 1987). It has been suggested that many researchers had misconceptions that pilot studies required too much time and energy for the research team to bother with them, given their narrow range of purposes (Prescott & Soeken, 1989; Hinds & Gattuso, 1991). But as Cope (2015) observed, while a pilot or feasibility study could be seen as “a burden or an added step in conducting a large-scale study,” researchers can realize benefits from these investigations that “outweigh the added effort and increase the likelihood of success” (p.196) even if there is no guarantee that they will avoid all problematic issues for the main study. Pilot study results can help identify actual and potential problems that researchers can address before beginning the anticipated future study. It has long been recognized that when used this way, “pilot work serves to guide the development of a research plan instead of being a test of the already-developed plan” (Prescott & Soeken, 1989, p. 60).

Researchers have come to understand that not only can pilots help answer methodological questions that could guide the researcher toward “empirically determined non-arbitrary answers to design issues” that need to be addressed (Prescott & Soeken, 1989, p. 60), pilot studies can serve other important purposes (Doody & Doody, 2015). An investigator might undertake a pilot in order to evaluate the execution of the methods and feasibility of recruitment, randomization, retention, measurement, and assessment procedures; the implementation of new procedures and interventions (Leon, Davis, & Kraemer, 2011); refining new and existing tools (Polit & Beck, 2004), or widening or narrowing eligibility criteria for the recruitment of participants (Conn, Algase, Rawl, Zerwic, & Wyman 2010). For instance, Chu (2013) conducted a pilot study on teacher efficacy to evaluate the clarity of the items to be used in the formal study in order to ensure that measurement instruments were reliable and valid in the educational context before undertaking the formal study.

A pilot study is often performed to test the feasibility of techniques, methods, questionnaires, and interviews and how they function together in a particular context; it can also reveal ethical and practical issues that could hamper the main study (Doody & Doody, 2015). Therefore, pilot studies help researchers identify design flaws, refine data collection and analysis plans; gain experience with and train the research team; assess recruitment processes; and learn important information about participant burden prior to undertaking the larger study (Prescott & Soeken, 1989; Beebe, 2007). If participants experience difficulty in completing survey instruments, this may prompt researchers to modify item wording, change the order in which questions are presented, or alter the instrument format (Conn et al., 2010). There is strong support in the literature that pilot studies should be undertaken to identify and mitigate risks associated with future study design, sample size, sample selection, data collection, data management, and data analysis (Jairath, Hogerney, & Parsons, 2000; Moore et al., 2011).

Feasibility studies. Feasibility studies evaluate individual critical components necessary for the large-scale study, such as participant recruitment, ability to execute the intervention, and accuracy of the intervention protocol (Arain et al., 2010; Tickle-Degnen, 2013). Conducting a feasibility study can be seen

as “a developmental learning process in which the study procedures and intervention can be adapted as necessary during the study to achieve the most promising outcomes” (Dobkin, 2009, p. 200). Following a feasibility study, the researchers identify strategies to address any challenges, and revise components as necessary prior to designing a pilot study to evaluate intervention outcomes in a more formal manner.

While there seems to be little difference from pilots, feasibility studies tend to focus on the *process* of developing and implementing an intervention and result in preliminary examination of participant responses to the intervention (Gitlin, 2013; Orsmond & Cohn, 2015). Dobkin (2009) highlights that “[b]ecause adaptation is an important feature of feasibility studies, establishing fidelity to demonstrate that the intervention procedures or protocols were implemented as intended most likely occurs in the pilot stage” (p. 200). Pilot studies, on the other hand, “more clearly focus on outcomes, rather than process, and include a more controlled evaluation of participant responses to the intervention” (Orsmond & Cohn, 2015, p. 2).

Lee, Whitehead, Jacques, and Julious (2014) agreed that the purpose of pilot trials is “to provide sufficient assurance to enable a larger definitive trial to be undertaken” (p.1), but they disagree with the order of feasibility and pilot studies described above. Instead, they support the notion put forth by Leon, Davis, and Kraemer (2011) that pilot results are meant to inform feasibility and identify modifications needed in the design of a larger, ensuing hypothesis testing study. They argue that a pilot serves an earlier-phase developmental function that will enhance the probability of success in larger subsequent studies; through pilot studies investigators are able to assess recruitment rates, usability of instruments, or whether certain technologies can be implemented and make indicated changes.

Leon et al. (2011), as well as Lee et al. (2014) caution that while a pilot study might be the first step needed when exploring new interventions or procedures, or innovative applications of an existing one, pilot studies are not used for hypothesis testing, or for evaluating safety, efficacy, and effectiveness. Therefore, feasibility and pilot studies are not expected to have the large sample sizes that are needed to adequately power statistical null hypothesis testing (Thabane et al., 2010). Moreover, “the outcomes of most feasibility and pilot studies should be measured with descriptive statistics, qualitative analysis, and the compilation of basic data related to administrative and physical infrastructure” (Tickle-Degnen, 2013, p. 171). Lee et al. (2014) observed that “pilot studies are more about learning than confirming: they are not designed to formally assess evidence of benefit;” and as such, it is usually more informative to provide an estimate of the range of possible responses (p. 10). Furthermore, Williams (2016) noted “that most journals do not expect to see an assessment of the effectiveness of interventions in articles reporting on feasibility or stand-alone pilot studies” (p. 8).

Publication

In the past, it was unusual to see publications of pilot or feasibility studies; reports were rarely seen of any testing of the processes, resources, and management of clinical trials (Tickle-Degnen, 2013). Although it is now much more common for pilot studies in medicine and nursing to be reported in the research literature (Thabane et al. 2010; Morin, 2013; Lancaster, 2015), it is less common in other fields and with other types of research, such as pilot studies of action research, or other qualitative methods (van Teijlingen & Hundley, 2002). Nevertheless, because of the many benefits that could be gained from the

sharing of information gleaned from these studies (Arain et al., 2010; Leon et al., 2011; Morin, 2013), researchers are encouraged to publish the results of pilot and feasibility studies (Eldridge et al., 2016).

Publishing is important for a number of reasons, not the least of which is that learning from the results of other pilot projects could potentially conserve time, energy, and research resources (Hinds & Gattuso, 1991; Doody & Doody, 2015; Eldridge et al., 2016). Additionally, the publishing of pilot outcomes in one field could facilitate collaborative projects with individuals in other areas once they are informed of the researcher's interests; what is learned in one profession or disciplinary area can be applied to other fields. For example, information from publications in health literature is relevant to and can be applied in educational research, as is the case with Bowen et al.'s (2009) suggestions from public health research about how to decide whether or not to undertake feasibility studies. Sharing key information, including pitfalls, can prevent unnecessary duplication of efforts and over-expenditure of public resources. More importantly, in research involving humans, it can minimize the impact on human subjects (Connelly, 2008; Conn et al., 2010; Wolfe, 2013; Doody & Doody, 2015) and facilitate culturally competent research (Kim, 2011). Therefore, researchers have both scientific and ethical obligations to try to publish the results of every research endeavor (Thabane et al., 2010).

Not only should investigators be encouraged to report their pilot studies, they should report the improvements made to the study design and the research process as a result of the pilot (van Teijlingen & Hundley, 2002). In quantitative studies, in addition to feasibility objectives, researchers should indicate how feasibility was assessed and evaluated and how they dealt with any recruitment issues (Algase, 2009; Thabane et al., 2010; Leon et al., 2011). In qualitative studies, researchers should indicate how the effectiveness of the data-collection and analysis techniques were evaluated; results should be interpreted within the context of viability and when necessary, include what is needed to make the study viable (Arain et al., 2010; Thabane et al., 2010). O'Cathain et al. (2015) noted that reports should include a description of the methods used for both quantitative and qualitative analysis and findings.

Application to Distance Education

Although many types of feasibility and pilot studies could be applicable to research in distance education, no framework or typology has been developed specifically for research in this field. Beyond the health arena, (where feasibility studies typically focus on preparing for drug trials in which a single drug or intervention is being tested for specific outcomes), published feasibility and pilot study frameworks are uncommon. In educational research, there is no single factor that might influence the behaviors and outcomes for students. Rather, a number of interrelated personal, circumstantial, and institutional factors (Berge & Haung, 2004) contribute to the learning and teaching experience and affect student outcomes. Moreover, educational outcomes are often theoretical constructs (preferences related to measures of student satisfactions) rather than direct observables (e.g., remediation of symptoms or a change in microbiology or physiology), and they are generally measured along a conceptual continuum (not a true count such as in tumor size or laboratory tests). Although course examinations and expected outcomes might be somewhat standardized, educational interventions are meant to be student-centered and highly individualized as opposed to highly standardized. Nevertheless, as described above, properly conducted pilot studies can greatly strengthen outcomes of the main study regardless of the field (van Teijlingen & Hundley, 2002; Cohen, Manion, & Morrison, 2007; Gudmundsdottir & Brock-Utne, 2010; Leon et al.,

2011; Doody & Doody, 2015). In the next section, we describe the process and outcomes of a pilot study conducted prior to the main study on attrition and retention in two undergraduate programs offered by distance education.

Pilot Study on Retention and Attrition

For the purposes of this paper, the definition of pilot study put forth by Doody and Doody (2015) is used, where “a pilot study is a small-scale version of a planned study conducted with a small group of participants similar to those to be recruited later in the larger scale study” (p. 1074). The objective of the pilot study was to increase the probability of success in the main study by testing the feasibility of the procedures for recruitment and retention of participants, testing for content validity and face validity of the questions, and assessing the usability (including ease of access and navigation) of the technology employed for administering the questionnaire.

Methods

Conceptual Framework

Berge and Huang’s (2004) conceptual framework (Figure 1) was selected for its usefulness in organizing the data and study outcomes. In this framework, the variables identified as affecting student retention are clustered into three main categories: personal, institutional, and circumstantial (Table 1). “[B]oth students and institutions can identify specific variables in these three functional groups when making decisions to persist or when developing programs leading to persistence that is highly contextual to student, institution and event” (Snow, 2016, p. 2).

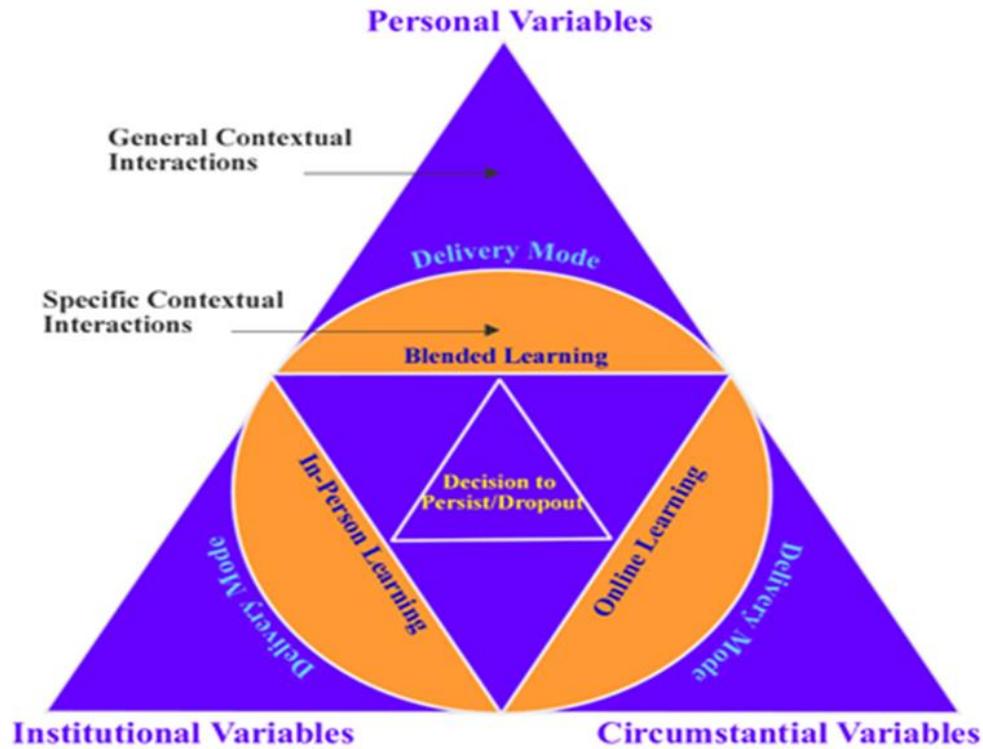


Figure 1. Sustainable retention model including e-learning. From “A model for sustainable student retention: A holistic perspective on the student dropout problem with special attention to e-learning,” by Z. L. Berge and Y. P. Huang, 2004, *DEOSNEWS*, 13(5), p. 16. Reprinted with permission.

Table 1

Range of Variables Affecting Retention

Category	Group	Identified Variables
Personal	Demographic characteristics	Age Ethnicity/race Gender Parental educational level Parental expectations
	Individual attributes	Academic skills and abilities Learning strategies Motivation Prior educational experiences Self-efficacy for learning and performance Task value
Institutional	Organization characteristics	Institutional attitudes: Beliefs Values

	Academic and social characteristics	Degree of congruence between the needs of individual students and the philosophical leanings of the institution Learner support Normative systems process Structural processes
Circumstantial	Institutional interactions	Social interactions with students Academic interactions Course design and facilitation
	External interactions	Student's: Family circumstances Responsibilities and perceived stress The learner's life Levels of satisfaction Work

Randolph and Crawford (2013) posited that “studies such as Frankola (2001), Muilenberg and Berge (2005), and Young and Bruce (2011) have helped validate Berge and Huang’s (2004) three-part theory” (p. 54), while Snow (2016) observed that although it “appears to provide a holistic approach to student retention, this model has neither been widely tested nor reviewed in academic circles” (p. 2). Hence, our decision to further test the model in the distance education context was based on a number of factors. First, it has been tested elsewhere, and found to be a useful model in the context of distance education (Tyler-Smith, 2006). Second, it is recognized as a model that is flexible, “context specific” and “allows adopters to address variables as they are deemed relevant” (Berge & Huang, 2004, para. 22), and can be adapted to particular settings in ways that best enable researchers to examine which factors facilitate retention or contribute to attrition. For example, from an institutional perspective, researchers can identify areas where institutional support could affect retention rates such as “curriculum and instruction, academic and social supports, and institutional management” (Berge & Huang, 2004, para. 29).

Participants

The researchers of this pilot study shared the view that in any discussion of learner attrition, one needs to consider the factors that learners themselves cite as reasons for dropping out or not completing. The learner’s perception of what constitutes a barrier to continuation or a factor contributing to discontinuation or continuation, provides valuable insights in designing and implementing distance courses, continuing or improving the processes, support mechanisms, and strategies that can enhance retention. Therefore, our goal was to gain the perspective of those who discontinued their studies and those who graduated from the Health Administration (HADM) & Human Services (HSRV) programs at a single open and online university.

The Office of the Registrar provided the student non-completion and graduate data from January 1, 2010 to December 31, 2014. It was originally anticipated that the pilot testing would include a sample of up to 10 students; however, members of the Ethics Review Board questioned whether there would be an adequate response rate from students who had left the two programs, especially those who left a number of years prior to the study. Therefore, the pilot sample was expanded to enable more thorough testing of the response rate, the feasibility of achieving a viable sample for the pilot testing of the survey instrument, and the research processes planned for the main study.

To test our assumption that past students would respond regardless of when they left the programs, all students from the two programs were included if they met the completion and attrition criteria for the entire year (January 1 to December 31, 2010), which was five years prior to the study. Participants who met the university completion criteria were all those who graduated in 2010. Those who met the enrolment and withdrawal criteria for the Health Administration and Human Service programs included those who: 1) were enrolled in the program and had registered in at least one course on or after January 1, 2010; and 2) had been inactive in a course for any 12-month period up to December 31, 2010. (The participants for the main study met the same criteria for the period January 1, 2011 to December 31, 2014.) Table 2 shows the composition of the 2010 sample for the pilot study.

Table 2

HADM and HSRV Graduates and Withdrawals January 1 to December 31, 2010

<u>Program</u>	<u>Graduates number (%)</u>	<u>Discontinued number (%)</u>	<u>Total number (%)</u>
HADM	4 (9%)	39 (91%)	43 (36%)
HSRV	26 (33%)	52 (67%)	78 (64%)
Total	30 (25%)	91 (75%)	121 (100%)

Instrument

A comparative online survey design was employed to gain the perspectives of students from two different undergraduate programs to better understand what factors contributed to the completion of their studies or prompted their leaving prior to completion of their degree. As no validated questionnaires relevant to the conceptual framework were found in the review of the literature, adaptations were made to the “leaver” survey questionnaire used by the university to follow-up with students who discontinued their studies. As reported by the university’s Department of Institutional Studies, the questions had been tested for validity and reliability; nevertheless, the pilot allowed for field-testing of this questionnaire for content and face validity in order to obtain feedback on the following:

- clarity, errors, readability, impartiality, appropriateness of the type and format of questions; and
- time required to complete the questionnaire.

Most of the pilot survey questions were in Likert-scale format, with a space for open-ended questions where participants could share their reflections and feelings about the courses, programs, interactions with the university, circumstances facilitating their continuing or leaving, and their thoughts about

returning to this university, either to complete their undergraduate program or to enroll in graduate studies. The questionnaire also included questions on demographic data related to student personal profiles: place of residence (rural or urban), gender, age, marital status, dependents, previous experience with distance education, and institutional data: program information, the length of time as a student, reasons for leaving, factors that facilitated continuing on to graduation, etc.

As much as possible, the survey questions were organized related to personal, institutional, and circumstantial variables. Attempts were made to eliminate bias and to systematically incorporate accepted best practices into the survey (Friedman, Friedman, & Gluck, 1988; Friedman & Amoo, 1999). The final version of the pilot survey was comprised of 66 questions, which were converted to LimeSurvey Version 1.92+, an online Open Source Survey Application, using both Likert rating scale format and open-ended questions.

Process

The pilot testing process occurred over the first four weeks of the project. Institutional data on the student populations from the two programs was reviewed and the prospective respondents who graduated were differentiated from those who discontinued their program. The research assistants consulted Constant Contact (2015) for tips on writing effective invitations, and a decision was made to use three types of emails to communicate the main messages about the survey. First, an invitation email would provide information about the study, introduce prospective participants to the survey, invite them to participate, and explain that completing the survey would signify informed consent. Three days after the first invitation, a reminder email would be sent to those who had not yet replied. Finally, an email to express appreciation for their participation would be sent to the respondents after they submitted the completed survey.

The researchers tested the survey process to ensure the appropriate emails were sent and received; that the survey could be easily accessed and completed, and that the answers were recorded correctly in the LimeSurvey system, all of which were successful. Ethical approval for the study was previously granted through the university's Research Ethics Board (REB), however, prior to beginning the pilot study, the final version of the revised questionnaire, the invitation letter, and informed consent form were resubmitted to the REB for information and filing.

The invitation to participate was emailed to 121 potential participants, including a statement that the survey link would remain active for four days to respond. Twenty immediate automated responses indicated that the intended recipients had not been reached due to an incorrect email address. Those not reached included two graduates and six individuals who discontinued from HADM group (43), and seven graduates and five individuals who discontinued from the HSRV group (78). Hence, potentially 101 emails were received out of the possible 121 (83%) candidates. Table 2 illustrates the distribution of participants we believe received the invitation to the pilot study.

Table 3

HADM and HSRV Participants Reached From 2010 Pilot Sample

<u>Program</u>	<u>Graduates number (%)</u>	<u>Discontinued number (%)</u>	<u>Total number (%)</u>
HADM	2/4 (50%)	33/39 (85%)	35/43 (81%)
HSRV	19/26 (73%)	47/52 (90%)	66/78 (85%)
Total	21/30 (70%)	80/91 (88%)	101/121 (83%)

Results

Response Rate

The total responses were quite balanced between the two programs and between the graduates and those who discontinued. Table 4 shows the number of respondents compared to those invited to participate, with an overall adequate response rate of 18%.

Table 4

HADM and HSRV Respondents Compared to Invitees

<u>Program</u>	<u>Graduate number (%)</u>	<u>Discontinued number (%)</u>	<u>Total number (%)</u>
HADM	2/2 (100%)	6/33 (18%)	8/35 (23%)
HSRV	6/19 (32%)	4/47 (8.5%)	10/66 (15%)
Total	8/21 (38%)	10/80 (12.5%)	18/101 (18%)

Response Pattern

Within hours after the initial email invitation, six respondents completed the survey. No further responses came until the reminder email was sent on the third day. This indicates that participants are likely to respond close to the time they receive the invitation email, but tend to forget afterwards. Once the reminder email was sent, three people responded within a few hours. One respondent wrote: “Thanks for reminding me about the survey. I ended up filling it out.”

The research team deliberated about sending a final reminder on the evening of the fourth day, but decided against it to avoid annoying the students. By the end of that day, seven more individuals responded to the survey bringing the number to 16 at the deadline, with two responses arriving within the next few days for a total of 18.

Observations for Improving the Instrument and Methodology

Contacting Participants

Type of email address. The candidate’s type of email address was not verified before emailing the link to the survey; therefore, 20 responses to the invitation email indicated non-delivery, some from

automated work email addresses. The research team decided that for the main study, a careful review of the addresses was needed to avoid using government or other email addresses that appeared to be work addresses. It was decided also that those whose invitation emails bounced back would be contacted by phone.

Reminder emails. Participant response to the reminder emails indicated that sending reminders was a positive incentive in the pilot, and therefore would not have a negative effect in the main study. In fact, in the pilot, after the reminder on the third day, the number of surveys received increased from six to 18, as shown in Figure 2.

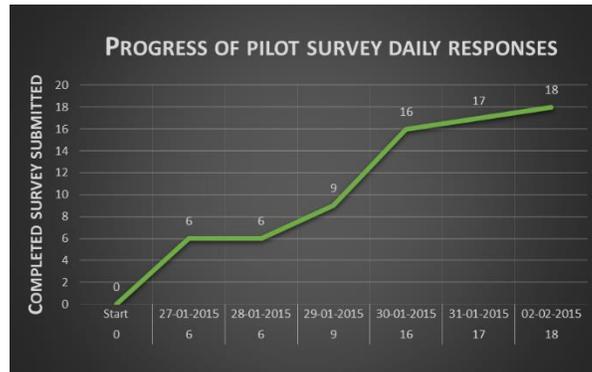


Figure 2. Response to reminder emails.

Instrument

Time to complete the survey. The survey instructions indicated that the 66 questions could be completed in less than 30 minutes. In the pilot, however, the average time to complete the survey was approximately eighteen minutes. The time it takes to complete a survey affects response rates (Cook, Heath, & Thompson, 2000; Walston, Lissitz, & Rudner, 2006); the ideal duration to secure response rates among college student populations is approximately thirteen minutes or less (Fan & Yan, 2010). Koskey, Cain, Sondergeld, Alvim, and Slager (2015) found that students reported that they would be likely to complete a survey “if it is perceived to take less than 10 minutes to complete” and would not likely complete a survey if it was “perceived to take more than 30 minutes to complete” (p. 21). The researchers decided that an average completion time of 20 minutes would garner an acceptable response rate among the targeted student population; accordingly, for the main study, survey instructions were adjusted to indicate that it could be completed in approximately twenty minutes.

Unanswered questions. The rate of answered quantitative questions was high and there was no sign of ambiguity; however, in 13 open-ended questions, eight people did not respond to one or more. In reviewing each question, the lack of response did not seem to be related to the clarity of the questions. Valuable feedback was received from those who did respond to those open-ended questions; therefore, these questions were retained.

Incomplete questionnaires. Of the three incomplete surveys, one participant had completed three out of nine pages, and two others completed two pages. One had been logged into the survey for 10

minutes, and another for two minutes. We could not determine if students encountered difficulties or deterrents to continue; no navigation problems were apparent that might prompt participants to stop.

Revisions to the instrument. Formal recommendations about the survey content and process were not solicited from the pilot group, although participants did provide suggestions to improve the instrument. As a result of the pilot, a few questions were re-ordered under personal, institutional, and circumstantial variables. The body of the survey was revised to improve clarity and facilitate ease of completion by shortening questions whenever possible, changing ranking questions (e.g., order of importance, 1-6) into rating questions (not at all important to very important); presenting and ordering questions to narrow the subsequent questions based on prior responses and relevance to the participant's specific circumstances (e.g., employment, program chosen, graduation, or discontinuation); and permitting multiple answers when appropriate.

In the open-ended questions, two students requested that someone from the university contact them to discuss continuing their education. Considering that others might be interested in continuing their studies, the contact information for the program directors was added for the main study. The researchers also decided that in order to embed as much flexibility as possible into the main investigation, the following statement would be added at the bottom of the questionnaire: "You may always go back to modify any answer if desired. Make sure that you click on the "next" button to apply the modification you just made." Additionally, it was agreed that questions would be added to elicit feedback about the survey itself, since this information could be useful for further studies.

Limitations of the Pilot

The main goal of this pilot study was to assess the feasibility of successfully recruiting participants for the study, and to evaluate the technical and navigational aspects of online survey process and the instrument itself. The pilot provided an opportunity to improve our research processes as a precursor to the main investigation. The pilot sample was confined to two undergraduate programs at a single open and online distance university; hence, the data and findings were generated from one institution. These two aspects may limit the generalizability of the pilot findings to other populations. Nevertheless, the conditions for the study are more uniform regarding faculty, course requirements, and institutional elements focusing on a single institution than studying several student groups across institutions and subsequently reduce the threats to internal validity (Robichaud, 2016).

Conclusion

The pilot study undertaken to test the feasibility of the research process and use of Berge and Huang's (2004) retention model as an organizing framework, was vital for informing the main study on attrition and retention of students in two online undergraduate programs. The planned procedures for recruitment and retention of participants, the usability of the questionnaire, and the technology employed for data collection were all tested. The positive responses and relatively good response rate in the pilot from individuals who discontinued their studies, confirmed the feasibility of a larger investigation using a slightly refined process. This was an important outcome given the concern from the Research Ethics

Board that distance education students who discontinued their studies would be unlikely to respond, especially if they left five years previously.

Furthermore, the pilot demonstrated that the online open source survey was conducive for data collection, which also supported the researchers' commitment to openness in all aspects of education and research. Finally, it was evident from the pilot that in an open and online learning context, the Berge and Huang's (2004) retention model is an effective framework for organizing the factors affecting student attrition and retention. This paper highlights the value of pilot testing in terms of improving the design of research studies, adds to the body of knowledge on pilot studies, and contributes to the development of best practices in open and distance education.

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Decision, Implementation, and Confirmation: Experiences of Instructors behind Tourism and Hospitality MOOCs



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Abstract

As the popularity of Massive Open Online Courses (MOOCs) continues to grow, studies are emerging to investigate various topics in this area. Most have focused on the learners' perspective, leaving a gap in the literature about MOOC instructors. The current research—conducted in the field of tourism and hospitality—explored early experiences of MOOC instructors as they progressed through three stages of the innovation-decision process: decision, implementation, and confirmation. The tourism and hospitality field was chosen because its related industries contribute significantly to global employment, and training is one of their critical success factors. MOOCs possess a good potential to benefit tourism and hospitality education, yet tourism and hospitality MOOCs are under-researched. Semi-structured interviews were conducted with six instructors who offered tourism and hospitality MOOCs between 2008 and 2015. Findings revealed that: (1) the instructors' decisions to offer MOOCs were mostly influenced by their institutes' interests in MOOCs; (2) when the instructors implemented MOOCs, a pattern of action emerged, which included six phases and one cross-phase element—prepare, design, develop, launch, deliver, and evaluate—and across phases—support and train; (3) most instructors chose to avoid risk in their adoption and implementation of the MOOCs, staying away from innovative teaching or learning activities such as peer-review assessments and collaborative activities; and (4) half of the instructors intended to repeat the experience of teaching in the MOOCs format in the future.

Keywords: MOOCs, instructors, diffusion of innovation, innovation decision process, motivation, tourism, hospitality

Introduction

The term MOOC (Massive Open Online Course) was coined in 2008 to describe the online course *Connectivism and Connective Knowledge*, which was offered to 24, for-credit students at the

University of Manitoba but also opened to 2,200 additional participants from around the globe (Siemens, 2013). Since that time, the proliferation of MOOCs has been beyond imagination. In 2015, the number of MOOCs totalled 4,550 provisions and involved more than 570 universities—reaching 35 million learners (Cook, 2016).

Despite the fast development of MOOCs, their offerings in the field of tourism and hospitality (shortened as T&H below) remain scarce (Tracey, Murphy, & Horton-Tognazzini, 2016), especially when compared with other subjects covered by MOOCs. This is somehow strange, if one considers the peculiarities of T&H field—e.g., high turnover, seasonality, new global challenges—which make the use of information communication technologies particularly relevant in order to provide flexible training and upskilling opportunities to very diverse audiences in the concerned industries (Cantoni, Kalbaska, & Inversini, 2009; Miralbell, Cantoni, & Kalbaska, 2014).

There were 51 T&H MOOCs by 2015, with 23 provided by higher education institutes (HEIs), mostly in the English language (18 of 23). A study by Ryan, Horton-Tognazzini, and Williams (2016) confirmed the dearth of T&H MOOCs. The first MOOC dedicated to T&H topics was *Tourism Industry Analysis*, offered on the Canvas Network platform by Central Florida University in 2013. In 2014, another MOOC offered by HEIs in the field of T&H was published, *Introduction to Wines 101* by Taylor's University (in Malaysia). In 2015, 15 T&H MOOCs from HEIs appeared, followed by seven more in 2016, and five more in 2017 (counting only MOOCs offered in English).

In October 2015, the first MOOC titled *eTourism: Communication Perspectives* by the Università della Svizzera italiana (Switzerland) joined the other offerings of T&H MOOCs and was launched on the iversity platform (<https://iversity.org>). The initiative, for the university, was an experiment out of the motivations of social corporate responsibility, developing the public relations and brand marketing; meanwhile, for the faculty, it was an opportunity to expand the existing T&H research into the domain of eLearning. MOOCs in T&H since then had become an independent research line in the university. As members of the development team, we have been through a full process of designing and implementing the MOOC as providers. The experience inspired a research problem: What are other instructors' experiences of providing T&H MOOCs?

As the number of T&H MOOCs increases, it may be helpful to introduce the existing experiences of instructors, so that we can better understand the situation, and identify problems that need to be considered in future developments.

Literature Review

T&H MOOCs and Relevant Studies

Just as the number of MOOCs in the T&H field is limited, so is the existing research on the subject. A search in Google Scholar on May 2, 2017 using the keywords “tourism” and “MOOCs” resulted in 18 relevant publications, including eight journal articles, eight conference proceedings' papers, and two book chapters.

The most relevant studies were from Deale (2015), and Annaraud and Singh (2017). The former study used a survey instrument to learn about 144 T&H educators' understanding, perception, and usage of MOOCs. Deale's results showed mostly neutral or even sometimes negative perceptions of MOOCs.

The latter study estimated the variance in perceptions of MOOCs between 45 students and 25 faculty members in the field of T&H in the US using a survey instrument, and found a significant difference in 11 of 31 variables. The overall analysis of the 2017 study also showed that faculty members and students had favorable feelings toward the use of MOOCs. Considering that Deale's respondents were also mostly from the US (121 out of 144), it would appear that over the course of only two years, the general attitude of T&H educators toward MOOCs had shifted from neutral/negative to positive.

Three publications reported results from their T&H MOOCs' practices. Hara, Moskal, and Saarinen (2013) presented their six-week tourism MOOC to evaluate teaching effectiveness by analyzing data from six in-course quizzes, one final exam, and four during- and after-course surveys. They concluded that the MOOCs format can demonstrate promising outcomes, and that its teaching of complex content to massive numbers of people around the world can be effective. Lin, Cantoni, and Kalbaska (2016) followed the ADDIE model (analysis, design, development, implementation, and evaluation) to produce their first tourism MOOC. The same MOOC was further reported by Lin and Cantoni (2017) to describe and demonstrate an evaluation strategy based on the Kirkpatrick model (Kirkpatrick, 2006)—it delineates four levels of training outcomes: reaction, learning, behavior, and results.

To date, no study about T&H MOOCs has been found that addresses the full experience of producing MOOCs as an instructor.

Studies of Instructors in MOOCs

Searching outside the field of T&H, it is possible to find existing literature about instructors in MOOCs. For instance, interviews with eight MOOC instructors from the University of Toronto revealed six themes: instructors' motivations to offer MOOCs; MOOC design, development, and delivery; measures for success; development success; development support; and implications of MOOC instruction (Najafi, Rolheiser, Harrison, & Håklev, 2015). Another study involved 14 interviews with MOOC instructors and reported three stages for each MOOC taught: preparation, implementation, and feedback (Zheng, Wisniewski, Rosson, & Carroll, 2016).

Doherty, Harbutt, and Sharma (2015), basing their study on the experience of developing four massive open online courses, suggest that "designing and building a MOOC can be a huge undertaking so a clear workflow is essential to keep on track" (p. 178). For a clear workflow to emerge—so that results can be optimized—thoughtful planning and practices are usually required. Another shortcut is learning from the experiences of previous practitioners who have already gone through the process. However, most MOOC researchers have investigated the learners' perspective, which leaves a significant gap in the literature on the institutional threats and opportunities, as well as on MOOC facilitators' experience and practices (Liyanagunawardena, Adams, & Williams, 2013; Ross, Sinclair, Knox, & Macleod, 2014).

DOI Approach to Study MOOC Experiences

To understand the whole process of how MOOC instructors experience MOOCs as an innovation, we need a detailed framework that can elaborate on the actual implementation process at the individual adopter's level. This calls for the Diffusion of Innovations (DOI) theory by Rogers (2003). Why use DOI instead of another well-known model, such as the Technology Acceptance Model (TAM)? The reasons are twofold. The first consideration is how a model applies to the situation at hand. TAM is applicable to the individual level of adoption, when what is needed is a better understanding of the factors that influence an individual's decision to adopt a technology. DOI, on the other hand, offers a

systematic framework to explore the relationship between technology and people and their interactions within a social system. It covers both the organizational level of adoption but also the intra-organizational level of adoption, which is not only subject to each individual's own will, but also influenced by organizational contexts. The second consideration is the research approach. TAM is a model offering a clear set of measurements for its major factors, such as perceived usefulness and perceived ease of use. These measurement features match perfectly with a quantitative research approach. In the theory system of DOI, its widely accepted model, Innovation-Decision Process (IDP), has proven to be efficient in exploring

the process through which an individual (or other decision-making unit) passes from gaining initial knowledge of an innovation (*Knowledge*), to forming an attitude toward the innovation (*Persuasion*), to making a decision to adopt or reject the innovation (*Decision*), to implementation of the innovation (*Implementation*), and finally to confirming this decision (*Confirmation*).” (Rogers, 2003, p. 168)

Moreover, IDP is perfectly suited to a qualitative research approach. A comparison of DOI, TAM, and IDP is presented in Table 1.

DOI was often adopted as the theoretical approach for MOOC studies related to student perception, student achievement, highly motivated students, higher education, online social worlds, and collaborative activity (Gasevic, Kovanovic, Joksimovic, & Siemens, 2014). It also supported research investigating MOOC diffusion among HEIs. DeRousie (2014) examined four innovations including MOOCs through the lens of DOI by considering factors related to diffusion and adoption in higher education. The dataset of 81 institutions was used to investigate the diffusion of MOOCs in the US. When it comes to individual adopters—instructors who teach MOOCs—one study (Evans & Myrick, 2015) surveyed 162 professors who had taught MOOCs, taking a DOI approach to better understand how MOOCs were perceived by instructors. On the strategic decision level, Murphy, Horton-Tognazzini, and Williams (2014) drew on the DOI theory and the tourism industry to investigate and propose two strategies for MOOC adoption and subsequent implementation.

However, no research has applied IDP to conduct an in-depth study of MOOC instructors' experiences of making decisions, implementing MOOCs with actions, and their intentions regarding whether to continue teaching MOOCs in the future.

Table 1

A Comparison of DOI, IDP, and TAM

	Level of adoption	Conditions to apply	Applicable research approach	Pros	Cons
Diffusion of Innovations (DOI)	Organizational, intra-organizational, individual	To investigate the maturity of an innovation, the different levels/characteristics of adopters, or decision-making process of an innovation.	Qualitative research approach	It can explore not only relevant elements such as technology and users but also the process of innovation diffusion throughout the social system.	Difficult to quantify, especially almost impossible to measure what exactly causes the adoption of an innovation. Meanwhile, cannot account for all variables.
Innovation Decision Process (IDP)	Intra-organizational	To explore the decision-making process of an innovation.	Qualitative research approach	The “process” element from the theory of DOI, with detailed stages of knowledge, persuasion, decision, implementation, to confirmation.	Stages follow each other in a time-ordered manner, which is not always the case. Difficult to quantify.
Technology Acceptance Model (TAM)	Individual	To investigate users’ perception of a technology, in particular tackling with the perceived usefulness and perceived ease of use.	Quantitative research approach	A parsimonious and powerful theory to reveal a relationship chain, having beliefs influencing attitudes, which lead to intentions and actual behaviour.	It has to be integrated into a broader one, which would include variables related to both human and social change processes, and to the adoption of the innovation model.

Research Questions

Our review of the literature suggested a gap across three areas: IDP, in-depth studies about MOOC instructors’ experiences and practices, and T&H MOOCs. Furthermore, MOOC researchers have favored a quantitative research approach, while very few studies have used methods traditionally associated with a qualitative research approach (e.g., interviews, observations, and focus groups; Veletsianos & Shepherdson, 2016).

Considering our research interests, past MOOC practices in tourism and the research gap in the literature, in this study we follow the IDP model and conduct in-depth interviews to explore MOOC instructors’ experiences and perspectives when producing MOOCs in the field of T&H. We include only three stages (adoption, implementation, and confirmation) from IDP, dropping the other two stages (knowledge and persuasion). The reason behind that decision was that our research interest was to identify common action-related experiences rather than to understand individual knowledge or inner thoughts affecting persuasion. Three research questions guided the process of this research:

- Why did instructors decide to adopt MOOCs in their professional career?
- How did instructors implement the MOOC innovation?

- How is the confirmation of MOOC decisions among instructors after the MOOC implementation?

Methodology

Between July 1 and December 9, 2016, all 30 instructors from nine different HEIs who offered T&H MOOCs between 2008 and 2015 were invited to participate in an interview. Six instructors, each from a different MOOC and university, volunteered and were interviewed.

The semi-structured interviews followed a protocol designed for this study, containing 13 open-ended questions. Interviews were conducted through Skype and recorded. The longest interview lasted 67 minutes, while the shortest one lasted 44 minutes. The average length of the six interviews was one hour.

An inductive approach was used to analyse the interviews' data (Creswell, 2012; Thomas, 2006) by: coding interviews and transcribing code segments relevant to research questions; collapsing codes into emergent themes and categories; corroborating interview data with other data sources; and preparing descriptive accounts of major and minor themes from the data.

Results

This section presents the major findings of the interviews as responses to the three guiding research questions.

Why did Instructors Teach MOOCs?

Four instructors did not autonomously decide to become MOOC instructors; the institutes' senior management decided to enter the MOOC market as providers, and once this occurred, these instructors were invited. Instructor 4 mentions that the first wave of MOOCs in his university were produced mostly due to pressure from senior management. However, he was glad that he took the challenge and went through this process because it opened a completely new world to him.

Sometimes MOOC platform providers invited universities to offer MOOCs on specific subjects, which was the case for Instructors 3 and 6.

They [platform's name] came with two different ideas: [subjects' names]. These are based on what people were searching for on [platform's name]. They did not have that course covered yet. They were looking for people with expertise in that area. They probably found us based on our [subject's name] activities, because we are very good in those areas. I just happened to be a good match between what interests them and what capacities we have. (Instructor 6)

Two instructors taught MOOCs on a voluntary basis. Instructor 1 chose to provide a MOOC because of his expertise and passion, with no support from the university. Instructor 2 volunteered to lead the MOOC experience after it was proposed by the head of the university.

The top three personal motivations mentioned by instructors to teach MOOCs were: institutional interest/pressure from the boss (five of six), trying MOOCs as a new technology/environment/tool for teaching (four of six), and sharing knowledge and subject matter expertise (three of six).

How did Instructors Implement MOOCs?

One imperative aspect investigated by this study was the actual implementation process of producing a MOOC as an instructor: “Implementation occurs when an individual puts an innovation into use. Until the implementation stage, the innovation-decision process has been a strictly mental exercise of thinking and deciding” (Rogers, 2003, p. 179). In the current study, the implementation process included all actions by instructors after the decision to offer a MOOC. In the conversations, six stages plus one cross-phase element were identified: prepare, design, develop, launch, deliver, evaluate, plus support and train (Figure 1).

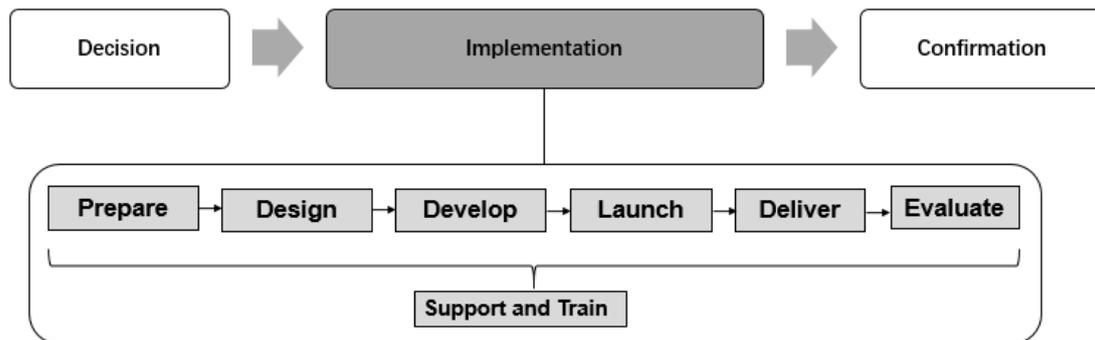


Figure 1. The implementation process of producing MOOCs: A map.

Phase 1: Prepare

Four instructors described the phase of preparation. Detailed actions in this phase were different among instructors. For Instructor 1, the situation was that there was only one instructor in the MOOC and no external support was available; however, the instructor had archived a rich collection of video materials from previous teaching of the topic, and these videos were reused in the MOOC.

Instructor 2 received enough money from the university to start the project but needed to recruit people and select a suitable MOOC platform as the first stage of work.

Two other instructors regarded the preparation phase as an opportunity to answer some basic yet critical questions before designing the detailed educational experiences, such as which level to teach, which topic to teach, how many videos to publish each week, and which activities to assign to complement the teaching.

Choose a topic. Four instructors said their MOOCs’ topics were chosen by the universities because of the high reputation of those HEIs in the respective fields.

So the university approach was to choose, from each of the four faculties, one area of research and education strength and to develop a MOOC from that. There were five MOOCs initially launched. One is from my faculty. So basically, it is to choose something that the university has a high reputation for. (Instructor 5)

Also, two instructors shared that when choosing topics, they were more likely to avoid overlapping content with the work of other MOOC instructors already available online.

Phase 2: Design

The design phase sets up the whole experience for the course's learners. You can think of it as the instructional design process. For Instructor 2, the instructional design of the MOOC was the result of a bottom-up approach with a lot of brainstorming sessions, which considered both the technical affordability and the observable effectiveness. This was possibly because his MOOC was the first MOOC experiment at his university, and hence there were no procedures already in place for such work.

Instructor 3, on the other hand, received strong and organized guidance to design his MOOC.

In the design phase, I was very much helped by them [a unit for the MOOC production at the university] in thinking of different pillars that I have to deliver. [...] I had this outline of the design and discussed the outline with them to verify my idea. After discussing with them, I went back to my original design and adjusted it. (Instructor 3)

However, sometimes even with very strong support, the work is still challenging. Instructor 6 was supported by around 10 people during his MOOC experience. For him, the design process turned out to be "quite heavy and probably a part that many people did not realize [how heavy it can be]." He described this stage as a mixed process of both preparing for video recording (mainly scripting) and designing the entire experience.

Phase 3: Develop

Experiences of producing videos. Except for Instructor 1, all the other five instructors experienced the process of development, including the development of videos and other content. During the conversations, these instructors talked about their videos' development.

Instructor 3 found the whole process of producing videos very easy. Instructor 4 suggested that having an engaging personality helps during this process. They both perceived teaching in front of a camera as being "acting" and very different from the traditional face-to-face teaching.

You are now like a star on TV. Not everyone can become a TV star or movie star. [...] You need to be an actor when you are doing a MOOC. (Instructor 4)

Instructor 6, besides being an instructor, also served as "producer" and supervised several other instructors in his MOOC when filming video lectures. According to him, there was trouble that began in the video scripting stage, which then continued in the studio during recording and editing.

Sources of content used in MOOCs. Four of six instructors stated that the content used in their MOOCs was mainly reused or adapted from their previous teaching activities.

Instructor 2 said the content did not mirror the teaching being done on campus, but it was closely related to the research activities his team conducted in the university. Instructor 6 mentioned that because MOOCs serve a lower level of learning, his team had to cut down their postgraduate programs' contents to better fit the need of MOOCs.

Phase 4: Launch

This stage comprises the process of assembling all the developed content and putting it on the platform in a structured way to make it accessible online. Five MOOCs were repeated after their first iteration, which usually had a fixed starting date. Instructor 2 stressed that promotion activities are to be done by the MOOCs' instructors before and after the launch.

Especially in the field of MOOCs, you need to be involved in terms of promoting the MOOCs, in terms of reaching out to the right audiences [...]. If it's corporate social responsibility and public relations after all, you need to reach the right public. So I was deeply involved in designing it and running promotional activities so as to make sure that we had contacts with hopefully interested people. (Instructor 2)

Phase 5: Deliver

Once online, the MOOCs enter the delivery stage, when various interactions happen within the course, as illustrated in Figure 2.

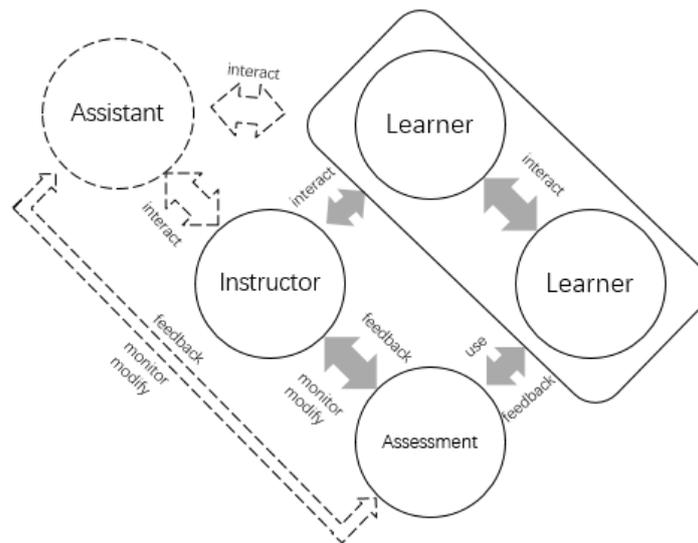


Figure 2. Interactions within a MOOC.

Intra-MOOC interaction: Online forums. All six instructors mentioned that their interaction with learners in MOOCs was mainly through discussion forums, either directly or through a teaching assistant.

Forums also made it possible for learners to interact with other learners. In Instructor 4's MOOC, a group of bilingual students volunteered to help another student whose English was not as strong.

Three instructors commented that the online forum as an interaction method was more than sufficient for them, and sometimes even too much.

Intra-MOOC interaction: Assessments. The interaction provided by assessments in MOOCs happens in an action-feedback loop. Some assessments are graded, such as quizzes, exams, and peer-review activities. Our interviews revealed that quizzes were often (all six MOOCs) used to measure learners' learning. Another method to encourage peer interaction is the peer-review

assessment, where a learner is required to submit an assignment and will not receive grades on it until giving grades to a certain number of submissions from others. Two instructors used peer-review assessments in their MOOCs and positively recommended it. In the best-reported case of peer-review assessments, the instructor commented:

I had some concerns before about using peer-review assessments, but I think [platform's name] did a good job because they ensure us that it is going to work because it worked in the past. You have to make sure particularly the grading criteria is clear, unambiguous, objective, and it obviously requires a lot of planning and effort of the people who put together the exercises. (Instructor 6)

Extra-MOOC interaction: Email and social media. Two instructors described the email conversations they experienced with MOOC learners outside the MOOC platforms. Instructor 1 said that he received too many emails and had to beg learners not to send emails so often. Instructor 3 also received many emails but commented that learners just need to express what they wanted to express and that he had replied to all their messages.

When asked about their attitude toward using social media as a communication tool with learners, most of the instructors expressed concerns and considered social media to be unnecessary (or not requested). Instructor 2 was an exception, showing a positive attitude and describing positive experiences with using social media as a part of his MOOC (in particular a Facebook group and a dedicated Twitter hashtag).

Monitor and improve the quality. Besides the interactions that happen within and outside of MOOCs, the instructors need to monitor the online content—using direct observation, analytic data provided by their platform, or feedback from learners. Our interviews revealed that modifications were made as needed to correct mistakes or improve the teaching.

Flipped classroom. Flipped classroom is a format of using a MOOC to teach basic knowledge and allowing for in-class time to address higher-level educational activities. No flipped classroom case was reported in this study. However, half the instructors introduced materials and activities from their MOOCs into their face-to-face classes at universities.

Phase 6: Evaluate

In this study, evaluation of MOOCs refers to the performance assessment of MOOCs from the perspective of their providers. In our interviews, we found that an evaluation procedure at the institutional level was missing in all the studied MOOCs. This is possibly because these MOOCs were still in the experimental or pilot stage and HEIs were only exploring such possibility.

Four instructors, however, did mention course-level evaluation experiences. These instructors mostly used an online survey to collect feedback from participating learners. In one case, the instructor had a comparatively better-organized evaluation approach for the MOOC.

I was asking myself whether it was a good experience anyway but I had the other people to reflect on formalization of evaluation so we had sort of at the managerial level four major layers to evaluate MOOCs and our MOOC in particular, which are: corporate social responsibility, public relations, marketing, and research. (Instructor 2)

When asked about the usage of analytic data in MOOCs, most instructors shared that they had plenty of data from MOOCs but did not have much time to use it, or only used it to monitor the quality of the course.

Four instructors discussed the gap between what they expected their pool of learners to be (when preparing their MOOCs) and what their actual pool of learners was. In fact, most instructors (four of six) tended to underestimate learners' backgrounds—especially their education levels—prior to delivering MOOCs.

Cross-Phase Element: Support and Train

Five MOOC instructors reported not receiving training from their universities. Four received training about the MOOC platforms directly from the platform providers. Only one instructor received some training from the central MOOC production unit in the university; this training was about how to design and teach MOOCs.

Five instructors were well supported by a team of four to ten people for the MOOCs' production. Three said that their MOOC experiences were under the guidance of a central unit from their universities, which took responsibility for supporting instructors when producing MOOCs.

Course assistants, available in four of the MOOCs, were often mentioned as being active throughout the whole process of MOOC implementation, especially during the delivery stage, where the mass communication with learners becomes a challenge to instructors. Like instructors, they had to frequently interact with learners and instructors, and were involved in assessment activities. Two instructors had no assistant, and they expressed difficulty in managing the course all by themselves without proper support.

Findings on Re-Inventions

Reinvention usually happens at the implementation stage (Sahin, 2006), which was described as “the degree to which an innovation is changed or modified by a user in the process of its adoption and implementation” (Rogers, 2003, p.180). Such efforts depart from the core or mainline version of innovation promoted by the change agency (Rogers, Eveland, & Klepper, 1977). Rogers (2003) stated one general assumption about reinvention: the higher the re-invention rate is when implementing an innovation, the faster the innovation will be adopted. Most instructors chose to avoid risk in their adoption and implementation of the MOOCs, staying away from innovative teaching or learning activities. Only two instructors referred to some elements of their MOOCs as inventive. One reinvention was in the content delivered through video: instead of the instructor being a talking head in a studio or conducting interviews in an office setting, the instructor created a documentary film. Another re-invention came as a result of the instructor adopting animated and interactive media in the MOOCs.

How is the Confirmation of MOOC Decisions Among Instructors After the MOOC Implementation?

When asked “are you willing to continue teaching MOOCs in the future and why?” three instructors gave positive answers, while the other three were hesitant to continue teaching MOOCs. Instructor 6 stated that he would not repeat the experience unless it could become less demanding and more rewarding. The other two instructors firmly stated that they did not want to produce a new MOOC in the future, but that under certain conditions, they might consider re-teaching the existing MOOCs.

Discussion

Through interviews with six instructors who taught T&H MOOCs between 2012 and 2015, we aimed to explore the reasons or motivations for offering MOOCs, the process of developing MOOCs, and the intention to continue offering MOOCs in the future. In this section, we present our results in comparison with the previous literature, explain the current study's contribution and suggest future improvements.

Stressful but motivating. Every interviewed instructor reported the experience as having “taken a lot of time, a lot of hours,” or being “overwhelming” or “difficult.” Instructors from other fields also reported similar experiences (Egerstedt, 2013; Najafi et al., 2015). Considering all the stresses, why would instructors invest time and effort in something that could risk their reputations in the case of failure? T&H MOOCs' instructors explained that their decision to teach MOOCs was mostly due to a request from the senior management. In the cases of personal motivation, the decision came from wanting both to experiment with MOOCs as a new technology for teaching, and to share knowledge on a topic about which the instructors are passionate and have expertise. Similar motivations were reported by instructors from other fields, for example, the wish to gain first-hand experience with MOOCs as a teaching tool (Egerstedt, 2013; Najafi et al., 2015), shaping the MOOC development in their specialism or subject (Egerstedt, 2013), and demonstrating the teaching of their host institute (Najafi et al., 2015).

Support is critical. The existence of a group of people who can dedicate their time, skills, and efforts to assist the various instructors who produce MOOCs at a university was considered effective and efficient. This institutional support, as a critical requirement when producing a MOOC (Corke, Greener, & Philip, 2016), can positively influence the sustainability of the existing MOOCs over the long run by maintaining the communication with online learners no matter when they join the MOOCs. In other words, MOOC design and delivery is a team effort requiring ample emphasis on planning and clarity (Najafi et al., 2015). Other findings also confirmed the importance of adopting a team approach to producing a MOOC (Alario-Hoyos, Pérez-Sanagustín, Cormier, & Delgado Kloos, 2014; Belanger & Thornton, 2013; Corke et al., 2016).

The contribution of a map. Our study has revealed six critical phases of implementing and offering a MOOC, plus one cross-phase element. These six phases are: prepare, design, develop, launch, deliver, and evaluate; plus, across all phases—support and train. These reported stages were partially addressed in previous works (Najafi et al., 2015; Zheng et al., 2016). The current study narrates the details of the IDP model's “implementation” stage in the context of MOOCs by summarizing MOOC instructors' practical experiences into a visual flow map (Figure 1). The map breaks down the stages divided by other scholars into more detailed phases, which can be useful in the following ways: (1) as a timeline, the process map demonstrates the complete process of producing a MOOC from the perspective of MOOC providers. The timeline allows for greater understanding of the experiences of MOOC instructors, which had been a gap in the literature; (2) as a guideline, the process map provides a possible path for forthcoming MOOC instructors to follow, which can help to improve MOOC practices in the future.

Face the discontinuity. The combination of two facts—institutional interest being the main reason of their decision of adopting MOOC practices and the high discontinuity of instructors—could be explained by the DOI theory as: the authoritative decision style resulted in a lower possibility of repeating MOOC practices by the early adopters. According to Rogers (2003), the decision by an

individual within an organization to adopt a particular innovation can be contingent (dependent on a decision made by others in the organization), collective (the individual can vote but eventually have to follow the group decision), or authoritative (the individual is told whether or not to adopt it). Authoritative decisions may increase the chance of initial adoption by individuals but may also reduce the chance that the innovation is successfully implemented and routinized (Greenhalgh, Robert, Macfarlane, Bate, & Kyriakidou, 2004).

Under the top-down approach of MOOC adoption within a university, to reduce the discontinuity of instructors, the university can consider the suggestions by Rogers (2003), who described the IDP as a process to reduce uncertainty and proposed five attributes of innovations that help to decrease such uncertainty. These attributes include: relative advantage, compatibility, complexity, trialability, and observability. Universities can make full use of the support and training as a string through all six phases, to package the early adopters' practices with these attributes. Such attainment can not only sustain the existing practices but also showcase best practices to attract new instructors as later adopters.

Between borders. Three possible connections can be bridged between the two educational contexts: face-to-face and online. First, T&H MOOC instructors adapted contents from their previous teaching, research, and practical activities to the context of MOOCs. This was the case with other MOOC instructors as well. By analyzing the mainstream MOOC platforms Coursera, edX, and Udacity, Yang (2015) found that the mainstream MOOC teaching mode is a continuation of the traditional curricular structure and the traditional teaching process. Second, assets built for MOOCs were introduced back to the face-to-face classroom, and became supplemental resources for students (Hollands & Tirthali, 2014), to improve or enhance the face-to-face learning experiences. Third, the application of the flipped classroom (Cook & Triola, 2014). Even not adopted in any T&H MOOC, the flipped classroom practices have been reported and encouraged in other MOOCs (Chen, Yang, & Hsiao, 2016; Lee & Rofe, 2016; Li, Zhang, Bonk, Guo, & Guo, 2015; Robinson, 2016). It is believed that by using blended learning or flipped classroom models, students can gain basic knowledge at their own pace through a MOOCs' high-quality content. As well, students can conserve their classroom time for learning experiences better suited to the social nature of a classroom, such as activities to deepen understanding, solve problems, encourage creativity, spark innovation, and train students in critical thinking (Anders, 2015; Ingolfsdottir, 2014).

Tools for interaction. As a built-in tool of the MOOC teaching format, the forum was highly valued by T&H MOOC instructors as the way to interact with learners. This result is consistent with a previous study (Stephens-Martinez, Hearst, & Fox, 2014), which surveyed 92 MOOC instructors and concluded that discussion forums were rated as the most useful resource for understanding class dynamics and preparing courses for the next iteration. "The ubiquitous online discussion forum has long been seen as a suitable place for asynchronous communication and discussion among participants on a large scale." (Zhang, Skryabin, & Song, 2016, p. 277); it is no surprise that the discussion forum fits perfectly into MOOCs, which host a mass audience globally.

By contrast, social networking tools did not receive positive feedback from T&H MOOC instructors. Facebook and Twitter in MOOC settings has been frequently practiced and researched. Facebook has been used to access resources provided to deepen the understanding of course content, and to encourage connectivity, peer learning and interaction, and learning about current trends (Liu, McKelroy, Kang, Harron, & Liu, 2016). Twitter has been used to connect peers and share information,

such as resources or comments on their personal and real-time status (Lin, Hoffman, & Borengasser, 2013). Facebook was found to have a greater impact than Twitter (Alario-Hoyos, Pérez-Sanagustín, Delgado Kloos, & Muñoz-Organero, 2014; Salmon, Ross, Pechenkina, & Chase, 2015), and also more useful according to MOOC learners (Liu et al., 2016). MOOC learners also reported that the social networking tools had a positive impact on the social aspects of their learning process (Brownell & Swaner, 2010; Dodge & Kendall, 2004; Kassens-Noor, 2012) but they preferred to use the social medium to which they were already accustomed (Veletsianos & Navarrete, 2012). T&H MOOC instructors may need not only proper guidance and support on how to use social tools to facilitate communication, but also—possibly more importantly—to better understand that these tools are welcomed by learners and that they can help to improve social learning in MOOCs.

Re-invent to innovate MOOCs. MOOCs nowadays usually contain video lectures, quizzes, discussion forums, and sometimes peer-review assessments. Our interviews' results suggest that T&H MOOCs did not typically go beyond these formats. The limitation in the pedagogy and effectiveness of MOOCs has been often discussed (Waldrop, 2013). Along with the fast development of web technologies, more and more widgets and applications emerge. The usages of various online tools in the MOOC context need further experimentation and research. For instance, it was suggested that for innovative teaching on the Internet, it would be interesting to add collaboration tools such as Google+ hangouts and shared documents to enable the fluid forming of study groups for some class types (Cerf, 2013). New ideas for the many uses of digital tools (Ingolfsdottir, 2014) can enrich the learning experience.

Conclusions

With the guidance of the IDP, we conducted semi-structured interviews with six HEI instructors who taught T&H MOOCs between 2008 and 2015. Our results uncovered useful insights into these early adopters' experiences through the process of decision, implementation, and confirmation. We identified the top three reasons these instructors decided to teach a MOOC, which included institutional interest/pressure, learning a new teaching environment, and sharing their knowledge and expertise. Based on their descriptions, we created a panorama map of the process of implementing MOOCs for instructors. The map includes six phases—prepare, design, develop, launch, deliver, and evaluate—as well as one cross-phase element: support and train. It was found that re-invention was a rare case among T&H MOOCs. After their MOOC teaching experiences, half the instructors were positive about continuing the experience, while the other half expressed hesitation and concerns.

The limitations of this study include a lack of discussion about the subject matter and pedagogy design of T&H education in the context of MOOCs. Another limitation is that the sample size was small. However, our interviewees accounted for 20% of all instructors and represented 67% of all HEIs that offered a T&H MOOC in the analyzed timeframe.

As an explorative study, this research sets an example to study MOOC instructors' experiences and perspectives with the IDP model. Future studies are needed, for example, to use the whole IDP model to study MOOC instructors, to include a larger sample of interviewees, or to apply the same approach to other subjects and compare the results.

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A Taxonomy of Asynchronous Instructional Video Styles

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Abstract

Many educational organizations are employing instructional videos in their pedagogy, but there is a limited understanding of the possible video formats. In practice, the presentation format of instructional videos ranges from direct recording of classroom teaching with a stationary camera, or screencasts with voice-over, to highly elaborate video post-production. Previous work evaluated the effectiveness of several production styles, but there has not been any consistent taxonomy, which would have made comparisons and meta-analyses possible. Therefore, we need a taxonomy of instructional video formats that facilitates the understanding of the landscape of available instructional video production styles. For this purpose, we surveyed the research literature and examined contemporary video-based courses, which have been produced by diverse educational organizations and teachers across several academic disciplines. We organized instructional video styles in two dimensions according to the level of human presence and to the type of instructional media. In addition to organizing existing instructional videos in a comprehensive way, the proposed taxonomy offers a design space, which should facilitate choice, as well as the preparation of novel video formats.

Keywords: video, instructional, lecture, webcast, podcast, format, production, style, embodiment, instructional media, MOOC

Introduction

(M)edia are mere vehicles that deliver instruction but do not influence student achievement any more than the truck that delivers our groceries causes changes in our nutrition. (Clark, 1983, p. 445)

Video lectures have been growing in popularity and many individuals, organizations, and universities are employing them in various instructional frameworks, such as in distance education and in the flipped classroom. Alongside the wide availability of online video lectures on various topics, there is also a wide diversity of video production styles and formats. In many cases, the same topic (e.g., statistics), is transferred on video lecture format with widely different production styles. Thus, every organization, or individual who aspires to create new video lectures, has to make an informed decision among the available video formats, but there is limited documentation on the attributes of each format and the factors that influence this important decision. Although, it costs very little to distribute video to millions of learners, the actual production cost of the video in the first place might be significant. Therefore, there is a need to organize instructional video styles in a simple way that facilitates the choice for the most suitable.

In order to create a taxonomy of instructional video production styles, we need to identify the main sources and representative examples. In addition to the popularity of educational videos on major video streaming sites and repositories (e.g., YouTubeEdu, iTunesU, MIT Open Courseware, VideoLectures.net, TEDEd, etc), there is also a growing number of organizations that offer video-based learning, such as Coursera, Udacity, EdX, Khan Academy, FutureLearn, and Iversity. A survey of the available videos and of the research literature has revealed that the selection of a production styles for a video lecture depends on the instructor's preference and feasibility, or on the organizational (platform) guidelines, rather than a structured theory (Figure 1). For example, all Udacity videos have the same presentation format. On the other hand, the videos on YouTubeEdu (which aggregates material from organizations and individuals) have significant variability. Overall, the most popular instructional video format seems to be the direct recording of the classroom or in the teacher's office with one camera. Nevertheless, what works well in a live classroom might not translate equally well into online video.

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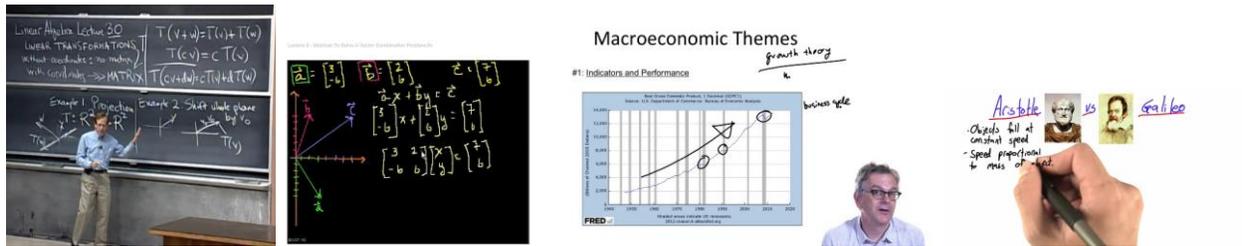


Figure 1. The presentation format of instructional videos ranges from direct recording of classroom teaching with a stationary camera, or writing board screencasts with voice-over, to highly elaborate video post-production with picture-in-picture, or video blending techniques (from left to right: MIT OpenCourseware, Khan Academy, Coursera, Udacity)

There are several video platforms that facilitate established universities and instructors in preparing and sharing instructional video. In addition to the generic video platforms (e.g., YouTubeEdu, iTunesU), in USA there are Coursera, EdX, and Udacity. In Europe the main ones are FutureLearn (UK) and Iversity (EU). Notably, each one of the major video-based education providers seem to feel very confident about its approach to video presentation style and has a consistent style across the video archive and across different subjects and disciplines. For example, Salman Khan, the founder of the Khan Academy has noted (Thompson, 2011, para. 27): “That way, it doesn’t seem like I’m up on a stage lecturing down at you. It’s intimate, like we’re both sitting at a table and we’re working through something together, writing on a piece of paper.” On the other hand, the Coursera platform suggests a teacher-centered video format, which presents the teacher either next to the slides, or at an overimposed small window. Finally, Udacity takes the middle road and displays mostly the hand of the teacher, who writes and gestures on an interactive drawing board. Despite the major differences in the production styles, there are also some common patterns, such as the presence of humans and the use of complementary instructional media. In this article, we are exploring the main instructional video classification factors and their nuances.

In the rest of this article, we are going to describe the main factors that define the design of instructional video formats. For this purpose, we have analyzed the state-of-the-art in the research literature and in the industry. The analysis of the research literature was based on extensive Google Scholar keyword searches (e.g., “instructional video” and “video lecture”) and the selection of a few recent articles (later than 2010) that have a very good number of citations per year (more than two yearly). The academic articles provided the theoretical groundwork for the taxonomy, which was refined by performing a review of existing instructional video styles in the industry. The review of existing instructional video styles was based on a few major video platforms (YouTubeEdu, iTunesU, Coursera, Udacity, Khan Academy) and aimed at collecting representative examples of different video styles, without regarding their actual popularity or other aspects of quality.

Academic Research on Instructional Video

Researchers have recognized that different video production styles might have different learning effects. In the largest study of instructional video formats, Guo, Kim, and Rubin (2014) have identified six basic types of video production style: 1) classroom lecture with instructor on the blackboard, 2) talking head of instructor at desk, 3) digital drawing board (Khan-style), 4) slide presentation, 5) studio without audience, and 6) computer coding session. Some notable findings include that students prefer short videos, slides should include a talking head, the Khan drawing style is more engaging than slides or coding sessions, and the direct classroom recording does not work well online. Nevertheless, in their study, all the courses were from the same platform (EdX) and all the courses are from science and engineering. Although previous empirical research has provided many insights about several video styles, the aggregate results are not comparable because they do not have a common ground with regard to the typology of video production styles. For example, there are many studies that have examined screencasts, but Ilioudi, Giannakos, and Chorianopoulos (2013) and Guo et al. (2014) refer to Khan-style, which is technically a particular type of screencast that records the pen-tip of the presenter on a digital drawing board. Therefore, there is a semantics issue with regard to the unit of analysis that might reduce the understanding, comparison, and extension of previous works.

In order to identify existing instructional video styles and resolve any possible terminology ambiguities, we have organized previous works according to two recurring themes: instructional media (e.g., slides, animation, and type) and human embodiment (e.g., social presence, animated human, talking-head). Indeed, Santos-Espino, Afonso-Suárez, and Guerra-Artal. (2016) examined the instructional video styles in contemporary MOOC platforms and classified them in two main categories: speaker-centric and board-centric. Although there are few instructional videos that employ just one style, they found that courses on humanities and arts emphasize the former, while science and engineering ones emphasize the latter. Social and life sciences employ a balanced approach between the speaker-centric and board-centric styles. Although they emphasize the use of the terms “speaker-centric” and “board-centric,” we could generalize these two terms to the broader notions “human embodiment” and “instructional media” respectively, which are more common in the learning sciences. Moreover, it is worth considering the nuances along the two dimensions: human-embodiment and instructional media.

There are many studies that define a low-level unit of analysis that regards very detailed aspects of instructional media. Sugar, Brown, and Luterbach (2010) have provided an analysis of instructional videos, which are based on the screencasting style (recording of screen). They found that there are two types of screen movement: static or dynamic (follows the cursor). They also found that there are two types of narrative: explicit that describes the exact actions on the screen and implicit, which describes the type of activity on the screen. Swarts (2012) examined screencasting videos with a focus on courses about the use of multimedia software and provided guidelines for the production of good video tutorials that belong to

the screencasting instructional video format. Video tutorials that explain the use of particular features of computer software are a very popular category and many computer users prefer to watch a demonstration than read a manual. As a matter of fact, the popularity of these video tutorials has also made popular the screencasting style of video instruction. Cross, Bayyapunedi, Cutrell, Agarwal, and Thies (2013) emphasized the use of digital writing on instructional videos and compared the use of handwriting to typefaces. They found that learners preferred handwriting, but they considered the typefaces more legible, so they proposed a middle of the road approach that fades hand-writing into a typeface as soon as a word is complete. ten Hove and van der Meij (2015) analyzed the popularity of instructional videos on YouTube. Although “popularity” is not always correlated with effective pedagogy, it is indicative of contemporary learner expectations. They found that popular instructional videos shared some common characteristics such as fast-pace, text highlights, static images and animations, and high-definition production. Their analysis is the first that correlates particular production elements to effectiveness, but those elements are related mostly to planning and post-production, rather than instructional video format. The above studies provide many insights about the design of instructional media in the context of instructional video, but there is no coherent framework, besides putting them in the same category.

Another major category of studies regard the presence, as well as the type of human embodiment, in the instructional video. Lyons, Reysen, and Pierce (2012) performed a longitudinal study (13 weeks), which compared the use of video lectures with (or without) a video of the instructor at the top left of the screen. They found that students considered the social presence of the instructor in the video to offer more learning. Ilioudi et al. (2013) compared the Khan-style to classroom instructional videos and found that there were no major differences in preference or learning performance between the two conditions. Notably, the comparison between video formats includes a control condition with a printed book. Therefore, video instruction is considered to be a supportive medium and not a substitute for traditional classroom learning. Chen and Wu (2015) compared three popular instructional video styles: 1) direct classroom recording, 2) studio recorded video lectures with the video of the instructor superimposed to the slides, and 3) office recording of the instructor video next to the slides (voice-over type). Although the latter style includes the presence of the instructor, they refer to it as “voice-over type,” because the slides and the voice are the main elements. Kizilcec, Bailenson, and Gomez (2015) compared the constant inclusion of a talking head in the video of a slide presentation to one with moderate presence of the face of the presenter. They found that there were no significant differences in terms of learning performance, but it seems that some students just prefer the presence of the instructor face. Li, Kizilcec, Bailenson, and Ju (2016) examined the acceptance of a virtual avatar in place of the instructor’s talking head. They compare multiple alternatives in the place of the human instructional video, such as animated human, animated robot, and real robot. They found that learners preferred the real or animated human condition to the real or animated robot, but the recall rates were mixed across conditions and genders. Mayer and DaPra (2012) have found that learners prefer a human-like (e.g., voice, eye-contact, and gestures) animated character. In particular, learners preferred real

human voice rather than computerized voice. The above studies provide many insights about the presence and types of human embodiment in the context of instructional video, but there is no coherent framework, besides putting them in the same category.

Table 1

Overview of Keywords Employed to Describe Video Lecture Styles in Previous Related Research

Video lecture style	Reference
screencasting, screen movement, narration	Sugar et al. (2010)
screencasting	Swarts (2012)
animated human	Mayer and DaPra (2012)
social presence	Lyons et al. (2012)
screencasting, khan-style, handwriting, typeface	Cross et al. (2013)
khan-style, classroom	Ilioudi et al. (2013)
khan-style, classroom, studio, office-desk, code, slides	Guo et al. (2014)
classroom, voice-over, picture-in-picture	Chen and Wu (2015)
Static pictures, dynamic pictures, text	ten Hove and van der Meij (2015)
slides, talking head	Kizilcec et al. (2015)
talking-head, robot, animated human, animated robot	Li et al. (2016)
speaker-centric, board-centric	Santos-Espino et al. (2016)

In summary (Table 1), previous research on the production style of instructional video has provided evaluations of particular video formats, but it has not done so in the context of a consistent taxonomy. The organization of previous research in a table that highlights the main classification factors of instructional video styles facilitates comparisons. Notably, there are some differences between the formats tested by previous research, but the most significant observation is that there are also overlaps and ambiguities due to the lack of a common framework. For example, some works have emphasized low-level elements (e.g., typeface), while other works have employed different terms for similar concepts (e.g., talking head, voice-over). In this way, the production style of instructional videos has been classified in many different, or overlapping categories, which makes it difficult to compare across studies, or to perform meta-analyses. Ideally, a coherent taxonomy would be inclusive of all existing styles and should facilitate the informed

choice for the production of a new instructional videos. Moreover, a future-proof taxonomy should also hold the predictive attribute for defining new production styles that do not yet exist.

In the next section, we examine contemporary instructional video formats, as found on online learning systems and video archives, in order to identify nuances across the two dimensions of the proposed classification scheme: human embodiment and instructional media.

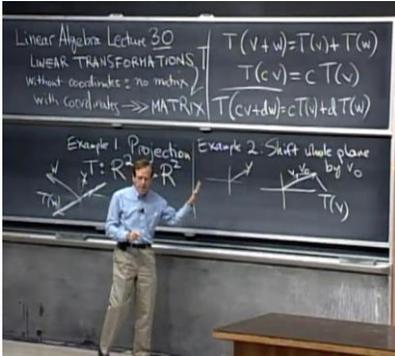
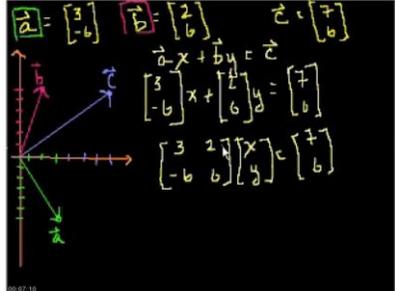
Taxonomy of Instructional Video Styles

The availability of instructional video has been increasing since the early 2000's, when broadband access from home became more affordable for more people. Initially, video lectures appeared on generic video streaming sites such as YouTube and iTunes University. Next, video lectures spread quickly to specialized educational organizations, such as MIT Open Courseware, TEDed, and Videlectures.net. Last, but not least, the instructional video format has become even more popular and refined within the Massive Open Online Courses (MOOCs), which have complemented video lectures with other popular e-learning elements, such as syllabus, e-books, assignments, discussion forums, wikis, and peer-grading. Although MOOCs are much more than just video lectures, the MOOC platforms have put a lot of effort in evolving the video lecture format. In this work, we focused on educational videos found on major instructional video repositories (e.g., YouTubeEdu, iTunesU, MIT Open Courseware, VideoLectures.net, TEDEd) and on organizations that offer video-based learning, such as Coursera, Udacity, EdX, Khan Academy, FutureLearn, and Iversity. Besides classification of existing video lecture formats, the proposed taxonomy has put special emphasis on the presentation of the main factors (human-embodiment, instructional media) that define the classification of each video lecture format, as well as on the breadth of existing and possible video formats along the main classification factors.

A Taxonomy of Asynchronous Instructional Video Styles
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Table 2

Index of Instructional Video Styles

Index	Screenshot	Human embodiment	Instructional media	Source
□		instructor, audience	animation	TED
○		instructor	blackboard	iTunesU
◇		pentip	blackboard	Khan Academy

A Taxonomy of Asynchronous Instructional Video Styles
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▷		hand	blackboard	Udacity
▽	<p>Macroeconomic Themes</p> <p>growth thro' k</p> <p>#1: Indicators and Performance</p>	talking-head	slides, pentip	Coursera
◇		talking-head	slides	Coursera
☆	<p>$\bar{x} = 68.2$ $s = 12.1$ $\text{max} = 95$ $\text{min} = 40$</p> <p>CI for μ $\bar{x} \pm z_{\alpha/2} s / \sqrt{n}$ $s = \sqrt{\frac{\sum (x_i - \bar{x})^2}{n-1}}$</p>	talking-head	pentip	Coursera
×		talking-head	instrument	MIT OpenCourseware

A Taxonomy of Asynchronous Instructional Video Styles
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<



people

instruments

MIT
OpenCourseWare

⊙

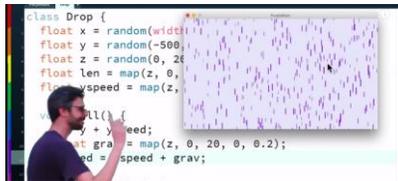


people

no media

Coursera

⊙



instructor

live coding

YouTube

⊙



robot

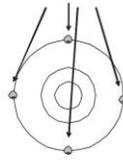
slides

Research

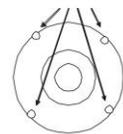
X



Filled Bonding Sites on
outer shell



Empty Bonding Sites on
outer shell



animated human

slides

Research

We performed a breadth-first random sampling of the available instructional video styles, in order to classify them in Table 2 according to two factors: human embodiment and instructional media. We examined several hundreds of instructional videos, before we could not find any new and significantly different video styles. The theoretical starting point of our taxonomy is the work of Santos-Espino et al. (2016), which we extend by generalizing and by providing a more nuanced spectrum of nominal values along the two dimensions. In the proposed taxonomy, there are two dimension that determine the instructional video style: 1) human embodiment, and 2) instructional media. For each one of the two dimensions there are multiple nominal values that range from the digital (or artificial) to the physical. Firstly, we survey the main instructional video styles in order to assign nominal values to the main attributes, and next, we assign each one on the Cartesian coordinate system with the respective index symbol, which is found on the first column of Table 2 with the nominal coordinates in the next cells of the table, in order to make the final scatter-plot representation more lightweight.

The proposed classification is mostly qualitative and aims to reveal the existing video styles, but it does not provide any information with the regard to popularity, or with regard to learning effectiveness, or suitability to a particular pedagogy, which are left to further work. In particular, the classification factors are nominal rather than quantitative, so the classification is not meant to be absolute about the particular nominal values, rather it is meant to be exact about clearly defining them before measuring them quantitatively. Both classification factors (human-embodiment, instructional media) have the same limits, which are fully digital and fully physical. Thus, the human-embodiment factor has been organized with nominal values that reflect a gamut of human-presence. Similarly, the instructional media factor has been organized with nominal values that reflect a gamut of different instructional media. Then, the mapping of existing instructional video styles on a nominal scatter plot is a straightforward visualization from the classification table.

A Taxonomy of Asynchronous Instructional Video Styles
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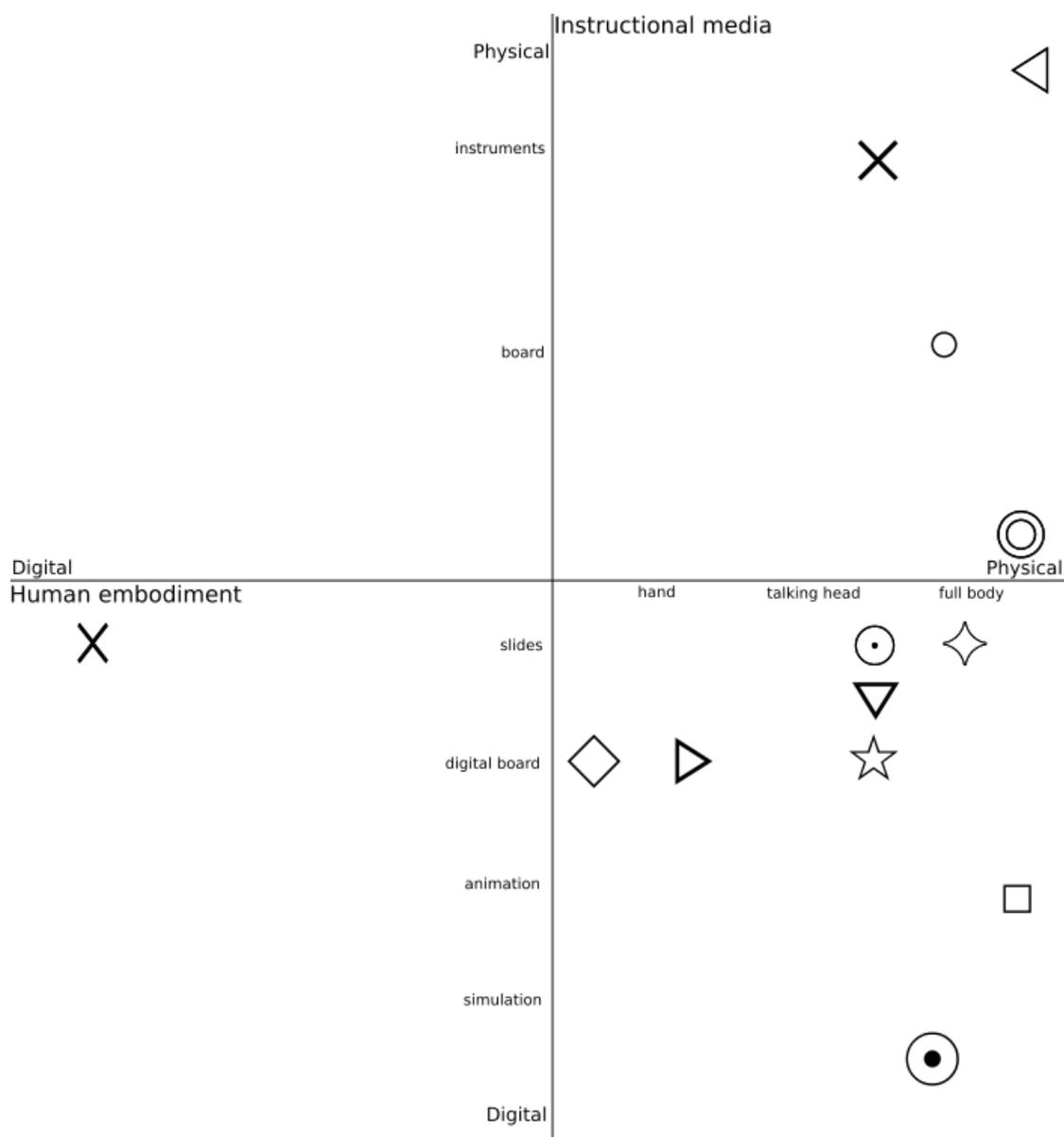


Figure 2. Taxonomy of instructional video styles into two dimensions.

In summary (Figure 2), instructional video formats can be organized into two dimensions: human embodiment and instructional media, which have several nominal values from digital (or artificial) to physical. Although the proposed taxonomy of instructional video styles is just a snapshot of the current situation, the focus of the taxonomy is on the classification factors (human embodiment, instructional media), rather than the details of the production style. Therefore, the discussion that follows is based on

those factors. The level of human embodiment varies widely between video lecture formats from wide shots that include the audience heads to screen capturing of the tip of the pen. The type of instructional media is another classification factor that varies from slides and animations, to objects manipulated by the instructor. The proposed taxonomy should be useful in understanding the landscape of available options when planning to create a familiar instructional video, or when designing a novel format.

Discussion

In comparison to previous related work, the proposed taxonomy: 1) holds the predictive attribute, 2) provides a fine-grained spectrum of typologies, and 3) is complemented with a visual representation of the existing and potential video production styles. Most notably, Santos-Espino et al. (2016) have accurately identified two major concepts (speaker-centric, board-centric), but they have only presented them as opposing conditions on one dimension. For example, they characterize existing instructional videos as speaker-centric if the speaker is more important than the instructional media, but, in our view, the speakers and boards are not in a competition for the attention of the learner. In contrast, the proposed taxonomy visually represents speakers and boards as two complementary dimensions and, at the same time, we define a wide continuum of instructional video production styles in a two-dimensional space. Indeed, the survey of existing styles in research and practice has revealed that there is a more fine-grained use of human embodiment and instructional media. For example, speakers might be substituted with digital or artificial agents (animated characters, robots) and boards need not always be digital, but might be physical, too. Finally, the most important contribution of the suggested taxonomy is a comprehensive visual representation of existing and potential new video production styles. In this way, the taxonomy of video formats is more than a map of the current situation; it becomes a tool for navigating toward novel instructional video production styles.

The visual representation of the instructional video taxonomy facilitates a systematic comparison between existing styles, as well as the design of new ones. It demonstrates that we are at an early phase in the development of instructional video styles, because most efforts just replicate the traditional classroom. Notably, there is a vastly underexplored space that regards the employment of artificial representations for humans, such as robots and animated characters. In particular, it is worth exploring the combination of artificial characters with digital media, which might be facilitated by video-game development toolkits. In this way, digital characters might appear to manipulate digital instructional media in the third quadrant. Moreover, there are opportunities in the employment of augmented reality technologies, which bridge physical instructional media with artificial characters. For example, there are TV-studio technologies that enable the tracking of physical objects and enable their interaction with artificial entities (objects or

characters). In this way, digital (or artificial) characters might appear to manipulate physical objects in the 4th quadrant.

A taxonomy of instructional video would not be complete unless we regarded the broader instructional framework. There are two main approaches to instructional video in education, which define a spectrum of options within them. Instructional video has been used as a substitute for classroom teaching in distance education, or as a complementary instructional tool in flipped-classrooms. For example, a video lecture prepared for distance education of adults assumes that the learner is going to have a minimal contact with the instructor and his peers. On the other hand, a video lecture prepared for K12 students who attend school, assumes that the learner is going to employ the lecture as an instructional medium for home study. Therefore, the motivations and the instructional design of video lectures might be influenced by the target group and the instructional framework. Moreover, according to Anderson and Dron (2010) educational pedagogy could be classified in three generations: cognitive-behaviorist, social constructivist, and connectivist. Contemporary instructional video seems to be at the former stage with videos created by teachers and distributed to learners. It is foreseen that video might be increasingly employed for peer-to-peer communication, or remixed and shared between learners and teachers. Therefore, further research could provide a taxonomy of video styles according to the pedagogical approach.

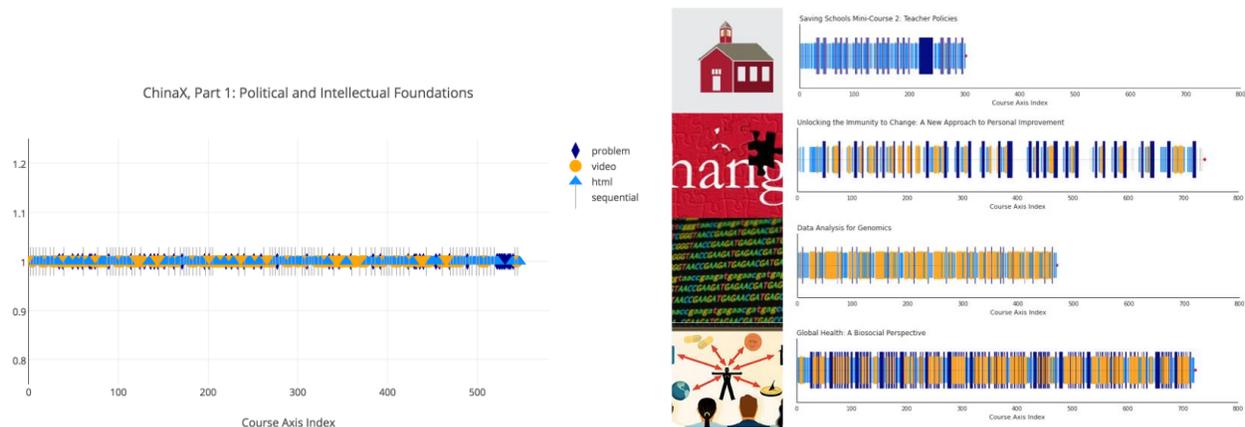


Figure 3. Video is just one component that needs to work with other equally important components (e.g., problem sets, hypertext) (left), while the actual mix of these elements might differ significantly among courses (right).

We did not consider neither the complete instructional design, nor the interaction design aspect of video lectures, but we focused on the visual organization of the video content. Instructional video is a major pillar in pedagogical design, but it is usually complemented with additional types of material (Seaton, 2016), so the selection of a video production style should take a holistic view that considers the type of the course (Figure 3) and the needs of the learners. For example, the Udacity video lectures are much more than video

recordings of a teacher and instructional media because they are highly structured in terms of learning design and provide the respective user interface that facilitates navigation through video and quiz content. For example, Sebastian Thrun, co-founder of Udacity, has suggested that the video lecture is useful only if it is segmented into many interactive quizzes, which keep the learner engaged just like a video-game does. The same practice is also followed by Coursera, but, currently, the video segmentation seems to be sparser than the one employed by the Udacity system. In addition to video, there are more instructional materials, such as problem sets, hypertext pages, as well as discussion boards. For example, two Stanford professors, Daphne Keller (co-founder of Coursera) and Peter Norvig (instructor at Udacity), have highlighted that their respective MOOC systems are benefited not only by the high quality of the video lectures, but especially by the synchronous assignments, which force students to synchronize and to virtually meet and cooperate in forums and local meet-ups. Thus, further research should evaluate the effectiveness of instructional video styles, in the context of particular pedagogical frameworks.

Conclusion

In summary, there are some interesting patterns across the evolution and the production style of video lectures. First, video lectures have started as simple recordings of hour-long lectures and have gradually evolved into one minute clips of highly legible and elaborate tablet writing. In particular, there has been an increasing use of technology to manipulate the video recording of the teacher and of the instructional media. Most notably, there is wide variability of human embodiment in the final video, from groups of people, to robots, and digital avatars. In this way, human embodiment and instructional media have been two complementary dimensions in the proposed taxonomy that defines a continuous two dimensional space of existing and potential new instructional video production styles.

Besides the theoretical contribution (disambiguation of terms, visual two dimensional taxonomy), in practice, the proposed taxonomy might facilitate the selection of a video style, or it might even motivate the production of novel ones. For example, a teacher might realize that the screencasting of slides might be enhanced with a drawing board, or a talking head video-feed, which add some extra personality to the final composite video lecture. Moreover, a more ambitious educator with access to studio equipment and skills might realize that there is a vast unexplored space at the third and especially at the fourth quadrant of the visual taxonomy. For example, a possible instructional video format at the fourth quadrant might combine digital avatars that operate on physical instrumentation, which is a common special effects in movies. In this case, we realize that in addition to some serious skills and equipment we also need strong imagination in terms of the possible pedagogies. Although the proposed taxonomy might be a necessary condition, it is certainly not a sufficient one for preparing successful video styles, because effective instructional video is a very complicated topic that also depends on pedagogy and production tools.

We expect that the experimentation with instructional video styles will continue in a path similar to the experimentation of other linear audiovisual content, such as TV and radio. Indeed, the first TV shows were just radio shows with a static image (Bolter & Grusin, 2000), but eventually the TV format has evolved in many novel directions. Similarly, we expect that instructional video is going to evolve away from simple classroom recording towards new formats. In the race towards novel instructional video production styles, a few content providers might be able to afford expensive and elaborate styles, which should result in high quality audio-visual appeal and might raise the bar of what is expected by learners. Although the tools of video production have been democratized with inexpensive high-definition cameras and post-processing at the desktop computer, there is still a big difference between an expensive Hollywood-studio movie and a low-budget production. At the same time, we expect that the mainstream instructional video might not be to the liking of everyone. Just like in movies, although production quality is important, there is always an audience for low-budget productions, which have to focus on other aspects, such as originality, narrative, and cinematographic style.

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Virtual School Startups: Founder Processes in American K-12 Public Virtual Schools



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Abstract

Traditional school districts do not have a lot of experience with virtual schools and have lost students to state and charter virtual schools. To retain students and offer alternative learning opportunities, more public districts are starting their own virtual schools. This study was an examination of foundational processes at three California virtual schools in traditional school districts. An analysis of the findings revealed that sites perceived the establishing founder, preliminary research, district support, teacher and staff selection, financial evaluation, and curriculum decisions as keys to the founding process. The analysis also led to surprising conclusions, including the need for virtual schools to constantly change and adapt and the focus in this study of organizations over technology. The findings have implications for traditional districts starting virtual schools. The study also indicates that changes in policy could reduce the need for organizational adaptation among virtual schools in traditional school districts.

Keywords: virtual school, K-12 online learning, organizational structure, traditional public school districts, foundational processes

Introduction

Schools where all or most teaching and learning happens online are a specific category of called virtual schools (Watson, Murin, Vasha, Gemin, & Rapp, 2011). These schools use the advantages of online learning to create holistic school organizations (Watson, Pape, Murin, Gemin, & Vashaw, 2015). They differ from traditional schools, referred to as *brick and mortar* since students do not meet with teachers and other

students in a physical space; most teaching, learning, and interaction occurs in an online space (Clark & Berge, 2005; Moore & Kearsley, 2012). Some virtual schools allow students to take all of their schooling through the online organization, a primarily North American phenomenon (Barbour, 2009).

Many of the earliest virtual schools in the United States were systems run independently by a state government, or were charter schools, run by independent organizations under special charter law. Statewide systems were run by state educational organizations, often receiving heavy funding from the state (Watson et al., 2011). Laws governing charter schools were developed to create flexibility for innovation not granted to traditional public schools. These governing laws allow charter schools to deliver curriculum more freely, escaping parts of stringent state and federal accountability (Ahn, 2011). Because traditional school districts were not granted the funding of statewide virtual schools or the flexibility of charter schools, they were late in starting their own virtual schools (Watson et al., 2011).

Many charter online schools are run by non-profit or for-profit organizations receiving public funds (Watson et al., 2011). Part of the purpose of the charter and school choice movement was to increase diversity competition with public schools and improve overall education (Lubienski, 2003). But in the case of virtual schools, there was little initial traditional school district competition (Watson, Winograd, & Kalmon, 2004).

Additionally, virtual charter schools were even more successful in diminishing traditional public school populations than other charters, partially because virtual schools are free of the physical constrictions and boundaries of other schools (Waters, 2011). Because of this threat, traditional districts have moved to create their own virtual schools in order to keep students in their districts (Watson et al., 2011). This allows school districts to capture their own students and maintain the funding these students create for their district. Virtual schools also create an opportunity for traditional districts to be part of school choice recruitment and compete for students outside of their own district boundaries (Moore & Kearsley, 2012).

Many traditional school districts are attempting to quickly start new virtual schools, but they may be unaware of the issues that influence founding an online school (Watson et al., 2011). Additionally, the average traditional school district is largely unprepared to deal with the unique circumstances of virtual schools (Ahn, 2011). Most online schools have been independent of district control or part of an independent online school district (Watson et al., 2011). Traditional school districts must navigate their relationship with dependent online schools differently than they do with their other schools and differently from other types of online schools.

A successful brick-and-mortar school organizational structure differs greatly from a successful virtual school organizational structure, yet many traditional districts founding new virtual schools often attempt attempting to function under a brick-and-mortar organizational model and encounter challenges (Archambault & Crippen, 2009; McFarlane, 2011a; Reid, Aqai, & Putney, 2009; Vrasidas, 2003). School districts attempting to start their own online schools need to understand how to adapt their organizational structure to create successful online schools to compete with other online school providers to effectively offer this alternative educational opportunity to students.

The purpose of this study was to examine how traditional school districts create online schools. This study adds to the body of research on virtual schools by examining specifically the processes that American K-12 traditional public school districts start their own virtual schools.

Description of Methodology

This study used a multiple case study approach to analyze virtual school startup processes. Multiple case studies examine several similar or contrasting cases (Stake, 1995). The cases studied were three virtual schools within traditional public school districts. The selected criteria for this study's case selection were dependent virtual schools, or virtual schools governed by a traditional school district. The researcher selected dependent virtual schools in traditional school districts in California that were at least in their second operating year. This ensured that the school had enough time after opening to encounter and adapt to contingencies. Virtual schools selected also were schools that have offered a fully online option since their inception and had been created in the district using district teachers, not outsourced to outside online providers. Thus, this sample was selected from schools in the state that met the criteria established by these parameters of the study.

Data were collected through document analysis, interviews, and observations. The data collection followed specific protocol pertaining to three phases of each school's history: the foundational phase, the adaptation phase, and the current phase. Data were analyzed through a double coding cycle utilizing descriptive and pattern coding. The findings were validated through triangulation and member checking. Pseudonyms were used to protect the anonymity of the school, related locations, and human participants.

Cases

To help provide a context for the study, each case is described here; this allows the readers to develop a sense of the schools and their organizational cultures. All of the school sites and study participants are identified by pseudonyms.

Manchester. Manchester is a K-12 virtual school in southern California. Manchester District began their online school because they had seen research showing schools in other states were losing students to charter virtual schools. Additionally, the superintendent was very interested in starting a virtual program. The district began developing supplemental classes connected to the high schools. These courses were designed with original curriculum written and taught by district high school teachers working part-time on the supplemental program. The district coordinator who developed these programs was reluctantly directed by the superintendent to begin a full-time online school and serve as principal. The school began a year after the district had employed supplemental online programs and hired successful teachers from the part-time program full-time. The school started at a former elementary school and consisted of a staff of one principal, one administrative assistant, one technology coordinator, and one full-time teacher. After the first year, the school was transferred to a campus that housed three other alternative education programs and the principal was made the director of the entire alternative education campus. The school shared administrative and facility resources at this campus. After two years, the virtual school adopted a middle school program. After five years, the virtual school added an elementary component to create a 1-

12 program, although the high school, middle school, and elementary programs all function differently. The school is in its sixth year of operation. The founding principal moved to the district office at the beginning of the year of the study as an assistant superintendent and then later left the district. A new principal was brought in from out of the district and had worked at the site for three months before this study began.

Branford. Branford is a virtual charter school in central California and is in its fourth year of operation. The Branford School began when a district media specialist who had been working with an online credit recovery program pushed the district to start a virtual charter school. The school initially began with high school teachers from the district who worked part-time and who created their own on-line curriculum and content. The school grew to nearly 100 students. After two years and some difficulties, the founding principal retired. Another director was hired who also oversaw the adult school and other alternative education programs. The district gave him a mandate to improve the virtual school or risk its closure. Another administrator who had been working with online content in an alternative education setting was hired to specifically oversee the virtual program. The new administration adopted a vendor-based curriculum they had used in the alternative education setting and started to hire full-time teachers. At first they hired one, added another, and hired part-time teachers as necessary. By 2014, in its fourth year in existence, the school had risen to 20 full-time teachers, three counselors, and an enrollment of 500 students.

Field Haven. Field Haven is a virtual school in northern California that at the time of the study was in its fourth year. Three district office co-directors, the district director of curriculum and professional development, the district director of communications, and another district coordinator were the initial administrative founders of Field Haven. The first two elementary teachers worked at the district curriculum office with the district curriculum department to launch the school. Field Haven adopted a vendor curriculum platform and began with two programs, a K-8 program that used full-time teachers and a high school program that used part-time teachers. After the first year of start-up, the school was turned over to an administrator and a small administrative staff who also ran the alternative independent school on a separate site. The new administrator evaluated the school's data and concluded that the high school program had insurmountable enrollment and financial issues. After the second year, the administrator recommended to the district board that the high school program be discontinued and the board agreed. The K-8 program maintained three teachers and moved into two rooms on the campus of another elementary school, which allowed students the opportunity to receive face-to-face teaching as well. The school has enjoyed a small but steady enrollment over the past few years.

Findings and Discussion

Evaluating the multiple cases revealed common themes among foundational processes. This section relates those findings and further examines their meaning. Stakeholder quotes and narratives are included to give a context for the findings and to drive discussion about the perception of foundational processes. Additionally, surprising conclusions are revealed and implications of the findings and potential areas of further study are shared.

Foundational Processes

The data revealed a varied list of foundational processes, which participants at the sites identified as important for start-up and success (see Figure 1). From this data emerged some important findings from each process.

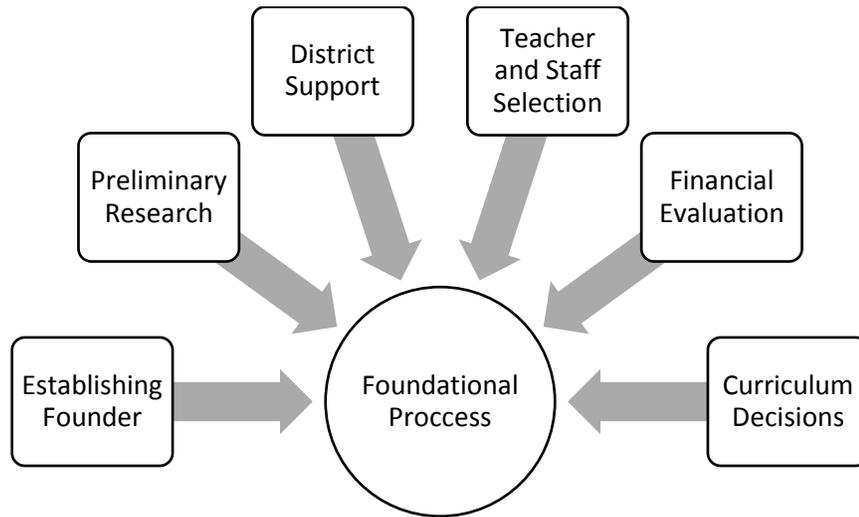


Figure 1. Identified foundational processes.

Establishing founder. Each school had an individual who led the process, but the source of initiation for each school differed greatly. Field Haven was initially a district creation, with three different district founders driving the foundational process and working with teachers in the first year before the school was handed off to a site administrator. These founders included the District Director of Curriculum and Professional Learning and the District Director of Communications, and another District Officer. Kelly, a founding teacher at Field Haven, explained:

The district wanted to start the program and it was the curriculum department that was kind of overseeing everything at the beginning, who did all the hiring, who sorted everything out. So we worked with the district office on the people that were on those departments or the people that were kind of our administrators.

Field Haven was the school most heavily driven by a district push, although the district involvement decreased significantly after the school's leadership moved to a separate administrator.

Branford's founding principal, Howard, was the source of the initial push for a virtual school in the district. Because of his interest in technology, he talked with district administrators for years until they allowed him to present some data to justify the need for a virtual school. Howard acknowledged that he often felt alone in the process and lacked the district support identified at the other two schools. He felt the district supported the virtual school, but no one at the district level had the expertise to work with him on the school's needs. He explained:

The support systems from the district for the overall program really were dependent on me and not on anyone else. They didn't know how to support the school. They used traditional measures to see if we were being successful. You know, grades, the attendance, and those things that were traditionally [measured]. The statistics that nobody ever looked at was how many kids didn't drop out of school because of the online school? Those statistics were hard to [obtain]. I felt supported by the school board and the administrators as much as they could.

Manchester also had a strong founding principal, Patrick, but the initial push for the virtual school came from other district leadership. Patrick had built the supplementary program that allowed for high school students in the entire district to take online courses and remain at comprehensive schools. The district superintendent wanted him to move towards a completely virtual school and the founding principal initially resisted, then agreed. Patrick explained:

She kept on trying to pressure me to do it. I kept on saying, "I'm not interested. I don't want to do that." We finally came to an agreement that as long as we were going to maintain the activity on the supplemental side, and it was going to be a part of the work at the full-time site, that I would go ahead and do the full-time site, but [they] had to stay connected to each other.

While some district leadership wanted a virtual school, the founding principal and his staff did the actual work.

All sites had one founder who took the reins of the school. Because the districts were focused in many directions, a founder was seen as key to focusing effort on the virtual schools and pushing the school forward. Because of the unique nature of the virtual schools, a strong founder was key to the process.

Districts starting virtual schools should identify a strong founder who can gain the expertise needed to focus efforts on the virtual school. While district support was identified as helpful, sites saw the need for a strong founder to establish and lead virtual schools.

District support and commitment. Both Branford and Manchester identified their district's support of the virtual school as a key factor to survival and success. The initial support was noted as especially important as the schools were in an experimental development phase. Manchester teachers expressed that they could try new things because the district supported their efforts. John, the Branford learning director, explained that in the beginning it was important to have district support because there were not any data to support that what the virtual school was doing was working. The district supported the school and showed faith in the process before the data demonstrated student success. Branford administrators and teachers also revealed that the district support increased as schools were able to demonstrate success. Once the school began showing real success in increased enrollment and improved student achievement, the district was ready to offer even more support. Table 1 displays cascading quotes from staff at Branford and Manchester about district support.

Table 1

Cascading Quotes about District Support

Participant	Quotation
Karen, Manchester Teacher	I heard the word pioneer like 17 times in meetings, and the superintendent would come and sit with us, and say, “You’re blazing the trail. No one’s ever done this. Of course, it’s going to be difficult.” There was a lot of support. We weren’t pressured to figure it out, necessarily. It was always OK to fail. We were allowed to explore, and try new things. In many ways, that was freedom most of us hadn’t had before. We did a lot of good work.
Patrick, Founding Manchester Director	There had to be a district commitment to walking forward a program that had no students with the belief that students were going to come, if you billed that they will come. We absolutely had the commitment. The district has been consistently supportive of the online program, in terms of dedicating dollars from the general fund to support it.
David, Branford Director	Once we proved ourselves, once they saw that we were serious about running the school, putting our guts into the school, and that we were serious about and we were passionate about, and once the numbers stayed, they gave us whatever we asked for. “You need more rooms? Take more rooms.” Once they saw the things are moving forward tremendously, they have been absolutely incredibly supportive.
John, Branford Learning Director	Our district said, “[John] we’re going to support you.” Then I started making money. Then they really support you.

Participants defined *support* as district confidence and trust, monetary support, facilities, and staffing. The monetary support was frequently identified when administrators talked about the economic downturn that affected California school budgets over the preceding several years. Administrators emphasized that the district support to continue to fund their virtual schools when many viewed the programs as supplementary or excessive was important to the schools’ survival.

Preliminary research. All three districts were involved in some research that either helped them determine the need for a virtual school or helped them determine the goals and direction of their virtual school. Howard, Branford’s founding principal, reported that when the superintendent requested data to show the need for a virtual school, the district found that 500 students were leaving the district a year from expulsions and other reasons. Once these data surfaced, the founder had more district support in starting the virtual charter.

Manchester also reported data that revealed the potential loss of district average daily attendance (ADA), which determines district funding in the state of California. However, the data Manchester reviewed were not from their district but from other states where online schools had grown over the years. The data

reviewed from Florida, Ohio, North Carolina, and Kentucky that revealed districts in these states were losing ADA student enrollment to outside virtual schools. While these data were never supported at Manchester, they did motivate the beginning of the virtual school.

In addition to reviewing the data from other states to determine the need for a virtual school, Manchester also looked to other states that had already embarked on virtual schools to identify best practices. District and school administrators went to Florida, Ohio, and Kentucky to learn from others' successes and mistakes. This initial research helped administrators make decisions about how to launch the new virtual school.

Field Haven's research process focused more closely on the community. The district launched fishbowl observations with community stakeholders including parents and teachers to guide its decision-making process. These observations helped the district identify what parents were looking for in a virtual school and how teachers and a vendor system could meet these needs. District directors were heavily involved with parent and community meetings throughout the launch process and Field Haven founding teachers talked to the researcher about the launch period as a time when they felt closely connected both to the district and to the community.

While the sites each undertook different forms of preliminary research, they all used research to make foundational decisions. The importance of some of this foundational research can be questioned since some of the sites eventually changed their direction. In other cases the research did not bear true, as was the case with Manchester's research of other states losing ADA. Even when initial data did not drive the virtual schools past their foundational stages, the fact that the sites conducted and analyzed research did prove important to their future adaptation. The culture of research they developed allowed them to continue to identify needs and change course when necessary.

Teacher and staff selection. All sites identified the ability to freely hire teachers and staff as important. During the hiring process, all three districts gave their sites freedom to select teachers, instead of placing teachers mandatorily. All three sites had a strong process for hiring teachers internally. Manchester built their hiring from teachers who had shown success in the supplemental online program. These teachers were chosen from a group who had undergone a voluntary pilot training program. Branford hired their first full-time teachers from teachers who had been successful in their independent study program. Field Haven created a hiring process to ensure dedicated teachers would lead the program.

The strongest support of the teachers at the sites can be found in the words of their administrators. Paul, the Field Haven administrator, expressed, "What I can guarantee you with our program is that our teachers are highly qualified. The students are going to receive the best curricular expert possible." John, the Branford learning director, shared, "You walk through those rooms back there. They've [the teachers] got the same passion I've got." The administrators demonstrated confidence in their teachers' abilities and they said that being able to select the teachers from their program made a huge difference in the quality of their school.

Teacher motivation can be an issue if teachers are placed at a site instead of selecting to be there, but that might especially be true when the site requires a new skill set like virtual schools do. Additionally, the sites

identified processes for training and evaluating online teachers before hiring them. This allowed the sites to evaluate teachers for online teaching skill set before hiring them. Districts starting virtual schools need to allow virtual schools to hire new staff who want to be at the site and who are identified as having a skill set valuable to online teaching.

Financial evaluation. Financial evaluations at the sites analyzed how the districts could financially support the schools. Sites were supported even in the wake of district budget cuts. Virtual schools in traditional school districts need to receive sufficient financial support. If virtual schools are seen as “extra” programs unworthy of the same financial support as traditional brick and mortar schools or as ways to generate ADA or save districts money, the virtual schools will not receive sufficient support for success. While the virtual school funding structure differs from traditional brick and mortar schools, virtual schools still require a great deal of funding to be successful.

Curriculum decisions. While this was identified as an important foundational process, the nature of the curriculum mattered less than the site’s confidence in it. Of the three sites, one used a vendor curriculum, one used a self-created curriculum, and one had switched from a self-created curriculum to a vendor curriculum. Many online curriculums have been successfully adopted. Sites and districts can focus a lot of time and energy trying to find the right one. But at the sites studied, the success of the curriculum depended as much on the implementation of the curriculum as anything. Some of the sites changed the way the curriculum was delivered during the lifetime of the school, so adaptation features discussed below may be as important as the initial implementation. Manchester created their own curriculum and it was a critical part of the school. Table 2 shows cascading quotes from several Manchester staff members about developing curriculum as a foundational process.

Table 2

Cascading Quotes about Developing Curriculum as a Foundation Process at Manchester

Participant	Quotation
Richard, Manchester Founding Staff Developer	We decided with the same book, the same curriculum, and the same pay scale at that point because we were all on district pacing at that point. That's kind of what they started. We looked at vendor products. We created some courses. We would try and break them up, arrange them to meet our pacing, our textbooks and so on. A lot of the courses were either created by the teachers or modified by the teachers to meet those district needs. There's very few vendor-created products that worked for that. We couldn't find any English classes that met our needs. We took the best of whatever we could and tried to cobble together.
Patrick, Manchester Founding Principal	Because we wanted to change teaching and learning, we didn't buy a canned curriculum. We built our curriculum to match the pacing. Integrated the same teachers, same textbooks, same assessments, that we were really trying to create a digital version of our particular curricular program

here in the district. Because we did it that way, it was a completely scalable solution.

Don,
Manchester Teacher

When you think about, my kids, in my regular classes, that I developed are going more in-depth than the [vendor-created] course. That's because I've always created curriculum and designed curriculum. We've had people come back and talk to us from INACOL. They were talking about how our courses are so far ahead of what most schools are doing online.

Surprising Conclusions

In conducting this study, the focus was examining the foundational processes school identified. In analyzing these findings, some conclusions developed that were contrary to some of the expected outcomes. This section presents these conclusions and includes discussion of why these unexpected conclusions exist and what they mean to the context of the study.

Site-district relationships. The relationship between the district and the school sites was an identified contingency and area of adaptation but not to the degree expected. For the most part, the virtual schools reviewed here were self-sustaining entities. They received funding and resources through the district as did other schools, but in some ways they functioned more independently than the other schools. One possible reason for this difference is that the districts were built to serve traditional brick and mortar school sites. Expertise at the district level was generally not suited to meet the needs of the virtual schools. The virtual schools held the expertise; thus, the districts allowed them to act more independently than the other school sites. Each of the sites identified a district ally, someone with power in the district office who believed in the program and wanted it to succeed. Whether this was the superintendent or a director, in almost all cases the support was not at a decision-making level. The district-level leaders deferred to the sites on most decisions. The exception to this rule was Field Haven in the foundational stages and first year in operation when a district-level position was making decisions for the school. But even her expertise limitations were discovered in the area of the high school and she eventually deferred to a site administrator.

Participants indicated that financial support, resources, and staffing were the most desired types of support they sought from the district-level leaders. All three sites identified their support from the district. The strongest identification for support came from the site that had received the most direct administrative and counseling staffing, Branford. But all three sites identified the need for more support. The feeling that the districts did not fully understand the virtual schools was also prevalent, and several participants argued that the calculations the district used to determine staffing and resources were based on the needs of traditional brick and mortar schools and that these districts did not understand the calculations did not apply to the needs of the virtual schools.

The structure of traditional school district calls for adaptation unique to virtual schools. The resources of a traditional school district can allow for support not being offered to independent virtual schools, but based on the findings from this study, there is also the danger that virtual schools will be forgotten, ignored, or misunderstood. In addition, the data from this study revealed the perceived need for districts to fully fund new virtual schools. The virtual schools cannot be seen as a money-saving measure and if anything, the

findings revealed that virtual schools could be more costly than traditional schools. Additionally, virtual school officials have to communicate their needs to districts through leaders who can articulate the unique circumstances of virtual schools and educate district officials on the advantages and trials of such schools. District administrators that hope to start virtual schools or who have recently started virtual schools need to ensure that expertise is developed not only at the site level but also at the district level so that appropriate support can be provided.

Need for change and adaptation. Each of the sites changed and adapted their organizational structures had changed and adapted as the school developed. Additionally, many of their goals and outcomes also changed. Change is a necessary part of any organization and any school, but the necessity for change seemed accelerated at these sites. The rate of change for these virtual schools was incredibly high for schools that had been in existence between four and six years. For example, Branford changed their entire curriculum, staffing, and leadership model after two years and Field Haven dropped their high school program after two years. Because virtual schools are a relatively new phenomenon and because each of these sites was a new undertaking for these traditional school districts, change, and adaptation were prevalent. Site leaders were learning how to implement new systems as laws and resources changed around them.

In the initial stages of this study, I anticipated that perhaps the findings might lead to a common list of methods and techniques that could help virtual schools adapt to the difficulties they would face or a best practices list because of the common context of virtual schools in traditional school districts. While these findings were manifest, the level of specificity of these techniques is not as high as originally expected. Instead, the sites studied revealed different ways of adapting to various issues. More important than the specific strategies employed was the ability of each site to adapt and change as needed in response to its specific context and experiences. Whether these techniques included a strictly structure organizational hierarchy as in the case of Branford, or a more open organizational system like Manchester, the actual structure used was less important than whether the structure allowed for adaptation and change.

Each of the sites studied demonstrated the ability to make large structural and procedural changes. Branford changed its entire curriculum, staffing structure, and administrative leadership after the first two years. Field Haven dropped half of its program. Manchester moved campuses, adapted to an alternative school structure, and added multiple grade levels. This level of structural change in such a short time is uncommon at most traditional brick and mortar schools, but among virtual schools this ability appears to be a necessity to adapt to an ever-changing system and to bridge the gap between the virtual site and the traditional school district.

Using mandated structures to advantage. Because virtual schools are part of a larger school district that must make decisions for the entire system, some systems were forced upon the case sites. This frequently happened with campus space, administrative staff, and office staff and resources. However, although these new structures were an identified contingency, sites found a way to use these structures to their advantage. Additionally, when sites were forced to take on other programs like the supplemental program at Manchester or the credit recovery program at Branford, they bolstered their virtual schools by using the resources of these added programs.

Organizations over context. McFarlane (2011a; 2011b) theorized that online schools require a unique organizational structure from brick and mortar schools. Because of these findings, I expected that the findings of this study would reveal adaptation strategies unique to virtual schools. While the study revealed accelerated change process for the virtual schools studied, most of the findings revealed successful adaptation techniques evident in many traditional schools, and even in many other types of organizations.

In other words, organizational strategies that work for virtual schools can work for all organizations and strategies that work for all organizations can work for virtual schools. This is an important finding because data revealed that district officials felt they could take shortcuts or invest less in virtual schools. This study revealed that the kind of organizational features that would create success in any school are equally necessary in virtual schools. The context shifts the make-up of what these features look like at virtual schools, but features such as district support, direct administrative leadership structures, and strong teachers can be credited as positive to any school site. Districts need to recognize that building a virtual school will take the same amount of effort and resources as sustaining a brick and mortar site, if not more.

The other surprise with this study was the lack of focus on technology. Because the topic involved virtual schools, it was reasonable to assume that technology would be a major focus of the initiative to develop a virtual school. But as shared by Roger, the principal at Manchester, the people and organizational processes are more important than the technological processes. “I think the technology part is probably the least interesting. [That] aspect is really not the hard part.”

Roger’s observation demonstrates what might be the most surprising and important finding of this study. The findings suggest that the most important features of these virtual schools were a strong organizational structure, effective leadership, and support from the district, while participants identified anything pertaining to technology or the online platform as secondary in importance. These findings suggest that the term virtual school needs to have a greater emphasis on the school side than the online side. Online is a system of educational delivery, however, the features of what makes a good school were more about organizational systems than technological platforms at these virtual schools.

Implications

Because virtual schools are a unique context for traditional districts, districts must develop structures that address this context. The findings indicated that these contextual processes were well defined, though not yet streamlined to the circumstances of virtual schools. Districts must study their local accreditation, enrollment, and funding processes and structures.

The findings also revealed that virtual schools that had strong systems planning, management, and leadership dealt with fewer problems and obstacles than other schools who identified as struggling in those areas. In other words, systems planning, management, and leadership are strong indicators of initial and long-term stability in a virtual schools. Therefore, districts that are starting virtual schools need to create direct and defined leadership at sites, financially support the virtual schools, and hire dedicated full-time teacher leaders to avoid some of the setbacks that some of the sites studied encountered.

Another finding suggested that virtual schools studied needed to be adaptable in the process of operation. In other words, while a well-developed plan was helpful, the need to abandon parts of that plan and move

in a different direction was identified as necessary to adapt to unforeseen contingencies, especially in the changing landscape on virtual school policy. These identified strategies could benefit traditional virtual schools in adapting to the unforeseen contingencies they will encounter. Additionally, a focus on these features could be beneficial to any schools or organizations facing unforeseen obstacles.

The findings of this study inform traditional school districts that creating and operating a virtual school requires a strong organizational structure, effective leadership, and support from the district. In the three cases studied, the organizational structure, leadership, and district support were more important to the success of the schools than anything pertaining to technology or the online platform. Because virtual schools use a unique online platform and require technology, these tend to be areas of focus by administrators and researchers. However, the findings from this study imply that more focus needs to be devoted to the organizational features of a virtual school in order to ensure success. Districts starting virtual schools need to ensure that these organizational factors are addressed instead of getting lost in the online and technological delivery systems.

While this study identified unique features in this process that pertain to virtual schools, this formula for success is not limited to virtual school. As traditional districts strive to design successful school, the virtual school must be seen as a unique but equal organization. Though the techniques may differ, the principles that will ultimately define success are similar to the traditional brick and mortar school. There cannot be short cuts.

Aside from informing leaders of traditional districts and virtual schools, the findings of this study are also relevant to policy makers. The study found that data relating to successful virtual school startup had less to do with the technology or curriculum of virtual school than it did with state policy and accreditation processes which not been adapted to the context of virtual schools. These issues could be eliminated or at least made easier to navigate if the legislators in California would acknowledge the difference in enrollment and attendance structures between virtual schools and brick and mortar schools. Legislators could design policy unique to virtual schools that accepted these structures instead of punishing virtual schools for adopting them. Additionally, accreditation boards could design processes that acknowledge the unique structures in virtual schools and utilize advisories with experienced virtual educators. The accreditation process would then educate the virtual schools, instead of the schools under review having to educate the advisory team.

Areas for Further Study

The cases selected were sufficient for the purposes of this study and the data did begin to saturate after the third school data was collected. However, examining additional cases with differing circumstances (rural environment, blended environment, etc.) could have revealed processes not identified in this study. Also, this study was only focused on virtual schools in traditional school districts. While more research exists on statewide and charter virtual schools, it does not focus on contingencies of virtual schools or adaptation features. Additional studies that examined the organizational structures of different kinds of virtual schools may provide findings about which adaptation features are beneficial in different kinds of virtual schools, or if they differ at all.

The cases selected for this study were all California virtual schools. While this yielded sufficient data on startup processes in California virtual schools, study of additional sites outside of the state could reveal additional strategies and obstacles. Additional studies could examine context inherent contingencies in other states. These studies could prove beneficial to identifying state policy that is most conducive for traditional school districts creating virtual schools and could have an impact on policy throughout the country.

All of the three schools studied moved away during their history from a fully online model to a blended model, one that allowed for some online interaction between teachers and students and some face-to-face interaction between teachers and students. Manchester moved toward face-to-face the most of the three sites, but all of the sites could be identified somewhere on the spectrum of blended learning. Online learning is moving more toward blended models and more research is needed to identify the impact of this new learning, as well as what are the features of successful blended models.

Additionally, one of the findings from this study that was not explored in depth was the lack of impact that technology had on the organizational structure at the sites studied. There exists research on the impact of technology on the curriculum of virtual schools, but further research on technology and virtual school structures. Such research could help answer why a correlation was not identified in this study and could also reveal untapped technological features that have not been used at the sites studied.

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Administrators' Perceptions of Motives to Offer Online Academic Degree Programs in Universities



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Abstract

Although the number of online academic degree programs offered by universities in Turkey has become increasingly significant in recent years, the current lack of understanding of administrators' motives that contribute to initiating these programs suggests there is much to be learned in this field. This study aimed to investigate administrators' perceptions of motives for offering online academic degree programs in universities in Turkey in terms of online associate degree programs, online master's degree programs, online bachelor's degree completion programs, and online bachelor's degree programs. A qualitative research method was employed for this study. Semi-structured interviews were conducted with 16 administrators from different universities' distance education centers in Turkey and thematic analysis was applied to the data. The research found that administrators' motives for offering online academic degree programs mainly involve in answering to the high demand of prospective students. Six major themes were identified with regard to influencing factors for administrators' motives: demands for programs, mission to support education, readiness of infrastructure, teaching staff as well as applicability of content, overcoming the shortage of classroom space and teachers, obtaining revenue, and gaining prestige.

Keywords: motives, distance education, online academic degree programs, administrators

Introduction

We are living in a world where technology develops day by day and plays an important role in our lives. As technology is rapidly advancing in today's world, it unavoidably becomes a part of our education (Çakır & Yıldırım, 2006). Accordingly, the technology of education is changing demographics and

human's expectations for the learning environment and forcing change in higher education (Casares, Dickson, Hannigan, Hinton, & Phelps, 2012). A report underlines: "People expect to be able to work, learn, and study whenever and wherever they want. This highly-ranked trend continues to permeate all aspects of daily life" (Johnson, Smith, Willis, Levine, & Haywood, 2011, p. 3).

As technological improvements create new opportunities, distance education programs have become increasingly popular in the world. Jarvis (2007) reported that technology-enabled universities develop learning opportunities to attract more students and to cooperate across the world. Simonson, Smaldino, and Zvacek (2015) reported that The United Kingdom Open University was established in 1969 with the first students enrolled in January 1971. Simonson et al. (2015) report several examples that indicate the demand for distance learning opportunities. For example, Anadolu University, established in 1982 in Turkey, reaches more than 500,000 students; The Open University of Hong Kong, founded in 1989, so far has had over 100,000 students; China established a National Distance Higher Education program in the late 1970s to early 1980s, which offered more than 30,000 TV-based courses and hired approximately 25,000 faculty staff; and Spain's Universidad Nacional de Education a Distance has enrolled about 130,000 students (Simonson et al., 2015, pp. 13-15). Moreover, the advent of the Internet technologies has played an accelerating role in distance education practices. A report issued in November 2013 indicated that by the 2012 Fall semester, the number of students enrolled in distance education courses of degree-granting postsecondary institutions (higher education institutions) in the United States reached about 5.4 million, of whom 83% were undergraduate and 17% were post-baccalaureate students (Snyder & Dillow, 2015). A more recent report by Allen and Seaman (2015) indicated almost the same results in terms of the registered students. According to The Distance Education Accrediting Commission (DEAC; 2017) there are currently 85 accredited distance education institutions in the United States that offer a variety of degree programs and some non-degree courses or programs. Thus, all of these numbers clearly demonstrate how distance education practices have had a global acceptance and popularity in the world.

Increase in Online Academic Degree Programs in Turkey

After the 1900s, as Internet-based distance education became an interest in Turkey, higher education institutions started to implement new opportunities for individuals. Universities throughout the country began to establish distance education institutions and centers to offer distance education programs. Between the years 1999-2002, a National Informatics Committee was established by the Higher Education Council (HEC) of Turkey to assure and accredit courses and programs of distance education institutions and support distance education in the country (Varol, 2010). In 2001, Anadolu University started the first completely online associate degree program in Turkey (Latchem, Özkul, Aydin, & Mutlu, 2006). In 2002, there were more than 40 academic degree programs offered via distance education institutions associated with various universities in Turkey (Varol, 2002, pp. 1252-1254). Latchem et al. (2009) reported that Ankara University, one of the pioneers in distance education, founded the Distance Education Center (ANKUZEM) in 2002, and after a year, it started to offer distance education programs, and enrolled 1,190 students (940 undergraduate and 250 certificate). Latchem et al. (2009) further exemplified the other two pioneer universities offering distance education programs. The first one is Sakarya University, which has the Distance Learning Research and Development Center founded in 2005. The second example is Ahmet Yesevi University, which established the Internet-based Distance Education Department (TÜRTEP) in 2001.

In Turkey, due to the increasing trust in distance education using the Internet technologies, universities are turning to distance education implementations (Engin, 2013). As more universities started to

implement distance education in their programs, universities' distance education applications in Turkey have increased in number accordingly. Today, many universities in Turkey offer distance education programs, ranging from master's degree, associate degree, bachelor's degree, bachelor's degree completion and certificate by providing on-campus or a combination of on-campus an off-campus education. According to the HEC reports there were about 75,000 students enrolled in the distance education programs in the 2015-2016 academic year (Higher Education Counsel [HEC], 2016). In 2016, according to the national Center for Student Selection and Assignment (CSSA), except for the traditional open education programs of Anadolu University, there were 35 universities actively offering 118 online academic degree programs (Center for Student Selection and Assignment [CSSA], 2016).

Institutional Motives for Online Academic Degree Programs

As universities increasingly implement distance education, it becomes essential to recognize the motives of institutions in planning a strategy for implementation of distance education, in order to better understand underlying dynamics of the increase in online programs in universities. According to earlier studies, institutional motives for offering distance education had the following factors: utilizing flexibility of the working environment (Betts, 1998; Dooley & Murphrey, 2000; McKenzie, Mims, Bennett, & Waugh, 2000; Rockwell, Schauer, Fritz & Marx, 1999), improving the quality of education (Dooley & Murphrey, 2000), contributing job satisfaction among faculty (Bonk, 2001; Dooley & Murphrey, 2000; Harris & Krousgill, 2008; Rockwell et al., 1999), supporting intellectual challenges and personal motivation to use technology (Betts, 1998; Panda & Mishra, 2007), providing support for education (Dooley & Murphrey, 2000; McKenzie et al., 2000), increasing access to the courses and enabling more students to attend education (Betts, 1998; Bonk, 2001; Dooley and Murphrey, 2000; Harris & Krousgill, 2008), monetary support and earning additional income (Betts, 1998; Bonk, 2001; Schifter, 2002), and cost effectiveness (Betts, 1998). Although earlier studies indicated a link between institutional motives for participating in distance education and initiating distance education programs, currently there is no available information specifically about administrators' motives to offer online academic degree programs via distance education. In fact, the earlier studies have had a tendency to identify a limited view of institutional motivational factors with regard to distance education in the abstract, but not directly online academic degree programs.

Purpose of the Study

The purpose of the study is to explore administrator perceptions of motives for offering online academic degree programs in Turkish universities to better understand the dynamics of the increase in online academic degree programs from the administrators' point of view. In other words, the study aims to investigate motives for offering online associate degree programs, online master's degree programs, online bachelor's degree completion programs, and online bachelor's degree programs. In the end, it aims to identify all related motives in-depth, which will assist policy-makers and program leaders in determining the appropriate policies in planning distance education strategies of universities. This study was guided by the following four research questions:

1. What are the administrators' perception of motives to offer online associate degree programs?
2. What are the administrators' perception of motives to offer online master's degree programs?
3. What are the administrators' perception of motives to offer online bachelor's degree completion programs?

4. What are the administrators' perception of motives to offer online bachelor's degree programs?

Method

Sample and Population

There were 47 university distance education centers in Turkey accredited by the HEC. Of these, 16 administrators (34%) participated in the study as shown in Table 1. Initially convenience sampling was used in the study to recruit participants from the population, then further participants who could provide useful information were selected using purposeful sampling.

Table 1

Demographics of the Participants, Communication Types, Interview Durations, Locations, and Record Types

#	Gender	Academic title / Position	Experience (Years)	Communication type	Interview duration (Minutes)
1	Female	Prof. Dr. / Director	2	Face-to-face	37
2	Male	Assoc. Prof. Dr. / Director	2	Face-to-face	28
3	Male	Assoc. Prof. Dr. / Assist. Director	3	Face-to-face	37
4	Male	Research Assist. / Assist. Director	8	Phone call	38
5	Male	Assoc. Prof. Dr. / Director	2	Phone call	26
6	Male	Instructor / Coordinator	4	Phone call	25
7	Male	Research Assist. / Assist. Director	11	Phone call	35
8	Male	Assist. Prof. Dr. / Director	3	Video call	73
9	Male	Assist. Prof. Dr. / Director	4	Video call	66
10	Male	Assist. Prof. Dr. / Assist. Director	2	Video call	47
11	Male	Assist. Prof. Dr. / Assist. Director	2	Video call	27
12	Male	Assist. Prof. Dr. / Assist. Director	2	Video call	49

13	Male	Assist. Prof. Dr. / Director	5	Video call	44
14	Male	Assoc. Prof. Dr. / Director	4	Video call	31
15	Male	Prof. Dr. / Director	4	Video call	32
16	Female	Assist. Prof. Dr. / Assist. Director	3	Video call	39
Mean			3.8		39.6

The sampling strategy included the combination of maximum variation, convenience, and purposeful sampling method by reaching readily available participants, which instead of seeking representativeness through similar types of online academic programs, it was sought by including a broad range of participants, to have maximum heterogeneity according to types of online academic programs.

Research Model

The qualitative research method was employed for this study. Semi-structured interviews were conducted with 16 administrators from different universities' distance education centers in Turkey and thematic analysis was applied to the data.

Data Collection Tools, Reliability, and Validity Studies

In this study, a semi-structured interview schedule was used to explore the administrators' perception of motives to offer online academic degree programs. It was aimed to let the interviewee state perceptions, opinions, and characteristics with regard to motives freely and in detail. Checking coding consistency and revising codes was made before applying the codes to all the data. To avoid bias and multiple interpretations of data, a peer evaluation was conducted by a subject expert, and a clarification of responses was assured by contacting interviewees a second time. After the pilot study was conducted, the researcher had a set of preliminary codes, but as the study continued, the codes were enhanced and increased in number resulting in the development of themes and concepts. Finally, all the findings were merged and revised with the suggestions of four subject field experts again. All of the interviews were completed during the year 2014.

The participants of this study were limited to the administrators of universities, who were readily available, who voluntarily agreed to participate, and were not necessarily representative of all universities. The validity of this study is limited to the reliability of the data, which accordingly relies on the instrument and the participants' honesty in their responses to the interview questions. Therefore, the study assumed that the participants would explain the institutional motivational factors that influence offering the online academic degree programs, and that the participants responded to the interview questions honestly and accurately.

Findings and Interpretation

Qualitative analysis methods were employed in order to extract themes from open-ended questions. Thematic analysis was applied to examine themes within the data. First, the researcher transcribed each recording and the related notes, then read through the transcribed data, dividing into parts (segments, concepts) and then assigning codes for each relevant text by searching and reading the whole data. The codes were then further reduced and merged into extracted themes and concepts by grouping the related codes.

Administrators' Conceptions of Motives in Offering Online Associate Degree Programs

To understand the conceptions of motives for offering online associate degree programs, participants were asked the interview question; "What are your motives to offer online associate degree programs?" An in-depth analysis of transcribed interviews identified six themes; "Demands" (13 participants), "Readiness" (9 participants), "Revenue" (6 participants), "Mission" (5 participants), "Prestige" (3 participants), and "Needs" (2 participants) as the characteristics of administrators' conceptions of motives for offering online associate degree programs. Twelve key concepts were extracted through the categorization of the responses. The themes and concepts are listed in Table 2 with frequencies.

Table 2

Administrators' Conceptions and Frequencies about the Motives of Offering Online Associate Degree Programs Characteristics

Themes	F	Concepts	F
Demands	13	Meeting the demands of prospective students	8
		Meeting the interest of teaching staff	6
		Meeting the demands of the HEC	1
Readiness	9	Utilizing the readiness of teaching staff	5
		Utilizing the applicability of content	3
		Utilizing the readiness of infrastructure	3
Mission	6	Support for education	5
		Meeting the demands of region	2
Revenue	5	Contribution to the financial satisfaction of teaching staff	4
		Contribution to budget	3
Prestige	3	Gaining prestige	3
Needs	2	Overcoming the shortage of classrooms and teachers	2

*Note. Some participants have more than one concept and represented more than one theme, so the sum of frequencies is greater than the number of participants. There was a total of 14 respondents to the question "What are your motives to offer online associate degree programs?"

According to the interviewees' responses, "Demands" (13 participants), "Readiness" (9 participants), "Revenue" (6 participants), "Mission" (5 participants), "Prestige" (3 participants), and "Needs" (2 participants) were regarded as the characteristics of administrators' conceptions of motives for offering

online associate degree programs. Administrators thought that online associate degree programs were offered to meet the prospective demands of students, the interest of teaching staff and the demands of the HEC; to utilize the readiness of teaching staff, the applicability of content and the readiness of infrastructure; to support education and to meet the demands of the region; to contribute to the financial satisfaction of teaching staff and to budget of the university; to gain prestige; and to overcome the shortage of classrooms and teachers.

Administrators' Conceptions of Motives in Offering Online Master's Degree Programs

Participants were asked the interview question; "What are your motives to offer online master's degree programs?" An in-depth analysis of transcribed interviews identified six themes; "Demands" (14 participants), "Revenue" (8 participants), "Readiness" (7 participants), "Mission" (6 participants), "Prestige" (5 participants), "Needs" (3 participants) as the characteristics of their conceptions of motives for offering online master's degree programs. Thirteen key concepts were extracted through the categorization of the responses. The themes and concepts are listed in Table 3 with frequencies.

Table 3

Administrators' Conceptions and Frequencies about the Motives of Offering Online Master's Degree Programs Characteristics

Themes	F	Concepts	F
Demands	14	Meeting the demands of prospective students	10
		Meeting the interest of teaching staff	8
		Meeting the demands of institutions	2
		Meeting the demands of university	1
Revenue	8	Contribution to budget	7
		Contribution to the financial satisfaction of teaching staff	3
Mission	7	Support for education	6
		Improving the quality of education	3
Readiness	6	Utilizing the readiness of infrastructure	3
		Utilizing the readiness of teaching staff	3
		Utilizing the applicability of content	3
Prestige	5	Gaining prestige	5
Needs	3	Overcoming the shortage of classrooms	3

**Note.* Some participants have more than one concept and represented more than one theme, so the sum of frequencies is greater than the number of participants. There was a total of 15 respondents to the question "What are your motives to offer online master's degree programs?"

Based on the interviewees' responses, "Demands" (14 participants), "Revenue" (8 participants), "Readiness" (7 participants), "Mission" (6 participants), "Prestige" (5 participants), "Needs" (3 participants) were underlined as the characteristics of administrators' conceptions of motives for offering online master's degree programs. Administrators thought that online master's degree programs were offered to meet the demands of prospective students, the interest of teaching staff, the demands of institutions, and the demands of university; to contribute to the budget and financial satisfaction of teaching staff; to support education; to improve the quality of education; to utilize the readiness of infrastructure, teaching staff, and the applicability of content; to gain prestige; and to overcome the shortage of classrooms.

Administrators' Conceptions of Motives in Offering Online Bachelor's Degree Completion Programs

Participants were asked the question; "What are your motives to offer online bachelor's degree completion programs?" After the analysis of transcribed interviews, six themes were identified; "Demands" (7 participants), "Revenue" (5 participants), and "Mission" (3 participants) as the characteristics of their conceptions of motives for offering online bachelor's degree completion programs. Six key concepts were extracted through the categorization of the responses. The themes and concepts are listed in Table 4 with frequencies.

Table 4

Administrators' Conceptions and Frequencies about the Motives of Offering Online Bachelor's Degree Completion Programs Characteristics

Themes	F	Concepts	F
Demands	7	Meeting the demands of prospective students	5
		Meeting the demands of university	4
Revenue	5	Contribution to budget	3
		Contribution to the financial satisfaction of teaching staff	2
Mission	3	Support for education	2
		Meeting the demands of region	1

**Note.* Some participants have more than one concept and represented more than one theme, so the sum of frequencies is greater than the number of respondents. There was a total of 10 respondents to the question "What are your motives to offer online bachelor's degree completion programs?"

According to interviewees' responses, "Demands" (7 participants), "Revenue" (5 participants), and "Mission" (3 participants) were underlined as the characteristics of their conceptions of motives for offering online bachelor's degree completion programs. Administrators believed that online bachelor's degree completion programs were offered to meet the demands of prospective students and universities, to contribute to the budget and financial satisfaction of teaching staff, to support education, and to meet the demands of the region.

Administrators' Conceptions of Motives in Offering Online Bachelor's Degree Programs

In order to determine conceptions of motives for offering online bachelor's degree programs, participants were asked the question, "What are your motives to offer online bachelor's degree programs?" After a detailed analysis of transcribed interviews, five themes were identified; "Demands" (3 participants), "Needs" (3 participants), "Readiness" (2 participants), "Revenue" (1 participant), and "Prestige" (1 participant) as the characteristics of their conceptions of motives for offering online bachelor's degree programs. Five key concepts were extracted through the categorization of the responses. There was a decrease in the number of participants responding to this question because of the fact that only some of the participants were offering or planning to offer online bachelor's degree programs. The themes and concepts are listed in Table 5 with frequencies.

Table 5

Administrators' Conceptions and Frequencies about the Motives of Offering Online Bachelor's Degree Programs Characteristics

Themes	F	Concepts	F
Demands	3	Meeting the demands of prospective students	3
Needs	3	Overcoming the shortage of classrooms and teachers	3
Readiness	2	Utilizing the applicability of content	2
Revenue	1	Contribution to the financial satisfaction of teaching staff	1
Prestige	1	Gaining prestige	1

**Note.* Some participants have more than one concept and represented more than one theme, so the sum of frequencies is greater than the number of respondents. There was a total of 6 respondents to the question "What are your motives to offer online bachelor's degree programs?"

Based on the interviewees' responses, "Demands" (3 participants), "Needs" (3 participants), "Readiness" (2 participants), "Revenue" (1 participant), and "Prestige" (1 participant) were underlined as the characteristics of administrators' conceptions of motives for offering online bachelor's degree programs. Administrators thought that online bachelor's degree programs were offered to meet the demands of prospective students, to overcome the shortage of classrooms and teachers, to utilize the applicability of content to distance education, to contribute to the financial satisfaction of teaching staff, and to gain prestige.

Conclusions and Discussion

As a result of this study, the following conclusions with respect to administrators' conceptions of motives in offering online academic degree programs have been derived:

Administrators' Perception of Motives to Offer Online Associate Degree Programs

- The main factors that determine the motives of the administrators to offer online associate degree programs are willingness of teaching staff to participate in online teaching and prospective students' demands, mainly because of receiving the same diploma as traditional on-campus students. Universities tend to accommodate custom online programs requested from prospective students via email, phone, or web. In addition, the willingness of instructors to form these programs strongly impacts universities' decision to initiate online associate degree programs.
- Having readily available infrastructure and well-experienced teaching staff, who are dedicated and willing to serve students in a distance education setting, plays an important role in offering online associate degree programs. For launching online associate degree programs, universities need learning management systems, content, servers, technical support, as well as well-experienced teaching staff.
- Administrators' motives are additionally based on the value of the institutional mission, which supports offering these programs in order to provide a wider opportunity for higher education in society. For example, universities that are located in certain areas are offering online associate degree programs depending on the needs of the region such as Tourism and Hotel Management.
- Income gains effect administrators' motives to some extent. These programs contribute to the budget and give teaching staff financial saturation. Teachers need to supplement their income. With the help of these programs they initiate ways that teachers can expand their income possibilities.
- Lastly, with the help of online associate degree programs, universities also, to a lesser extent, try to overcome the shortage of classroom space.

Administrators' Perception of Motives to Offer Online Master's Degree Programs

- The root causes that mainly shape administrators' motive to offer online master's degree programs are prospective students' demands for the programs and the level of interest of teaching staff. Universities are profoundly inspired by the top programs discovered through both prospective students' requests and other universities' implementations, thereby preferably attracting an increasing number of students. Additionally, it is regarded, rather, as an academic study opportunity for teaching staff. Accordingly, teaching staff's motivation and enthusiasm for academic study initiate administrators' motives for offering these programs.
- Another bottom line factor that shapes motives for offering online master's degree programs is the profitability. The factors; prospective students' demands and profitability of these programs interrelatedly effect administrators' motives to offer online master's degree programs. In other words, distance education centers prefer to offer online master's degree programs that already attract interest and, consequently, support the budget. For example, offering online business

degree programs meet increased prospective students' demands, and generate more revenue for universities.

- Moreover, institutional mission has an effect on administrators' motives to offer online master's degree programs. Universities' mission statements include an emphasis on improving the quality of education and spreading it to the great masses. These strategic intents to provide people lifelong learning and advance the quality of education in the country, drive program leaders to offer online master's degree programs.
- Administrators' motives for offering online master's degree programs additionally depend on readily available infrastructure, ease of content adaptability, as well as availability of experienced teaching staff.
- Lastly, administrators' motives for offering online master's degree programs are also driven by institutional ambitions to some extent, how these programs improve popularity and prestige among national universities in an increasingly competitive environment, and to a lesser extent, how they lessen the burden of classroom space.

Administrators' Perception of Motives to Offer Online Bachelor's Degree Completion Programs

- Primary motives of administrators to offer online bachelor's degree completion programs are under the influence of requests that come from two sources: Prospective students, with an expectation of improved personal rights for meeting employment requirements in order to be promoted to a higher level; and the university or the department.
- Factors for economic contribution to the budget, as well as improvement in teaching staff's financial satisfaction by providing an extra income, contribute to the institutional motives to some extent for offering online bachelor's degree completion programs.
- Additionally, universities try to create equal opportunities for students with disabilities or work commitments. Institutional motives to contribute towards creating equal opportunities for those who are unable to attend courses drive universities to offer online bachelor's degree completion programs.

Administrators' Perception of Motives to Offer Online Bachelor's Degree Programs

- Administrators' motives to offer online bachelor's degree programs mainly include answering to the high demand of prospective students and building an economic learning environment by reducing face-to-face teaching in classrooms so as to reduce the burden of classroom space and teaching staff.
- Other decisive factors, but to a lesser extent, that influence motives to offer online bachelor's degree programs are applicability of content, and adaptation to distance education. In other words, if core contents are appropriate for distance education, program leaders are more inclined to include them in the distance education centers catalogs of universities, because they want to spend less time to prepare for the sessions.

Although earlier studies are not directly related to online academic degree programs, similar findings in some of the different studies exist in the general framework of institutional incentives for distance education, which can be regarded as a basis for comparing the findings of this qualitative study. This study indicated that the common motive of administrators to offer online academic programs are shaped in accordance with meeting increased prospective students' demands in online programs, which also supported by a limited number of earlier studies in terms of faculty's intention to offer distance education for enabling more students to attend education (Betts, 1998; Bonk, 2001; Dooley & Murphrey, 2000). Additionally, Harris and Krousgill (2008) reported an overview of distance education with regard to the new directions, which also underline that due to the nature of distance education each institution wants to provide learning opportunities. With this opportunity, it is aimed to reach more students especially for those who cannot continue traditional education (Harris & Krousgill, 2008). Another common administrator motive for offering online academic programs is support for financial satisfaction of teaching staff to some extent. This finding of the study is also in line with the previous literature in terms of faculty's incentive related to earning additional income through distance education (Betts, 1998; Bonk, 2001). Moreover, Rockwell et al. (1999) reported that the major motive to deliver distance education is intrinsic in that rewards play an important role, as well as job satisfaction, in order to motivate faculty to offer distance education. Similarly, Engin (2013) underlined that in order to have more innovative applications in distance education, there is need of providing professional incentives. Additionally, Betts (1998) revealed a number of factors that initiate faculty's motives to start involving in distance education. Betts summarized that earning additional income, tenure, promotion, and job satisfaction motivate faculty to develop distance education opportunities (Betts, 1998). Similarly, this study also indicated that one of the motives of administrators for developing distance education programs is its contribution to budget, and contribution to the financial satisfaction of teaching staff. With regard to online associate degree programs, online master's degree programs, and online bachelor's degree completion programs, the study showed that administrators' motives to offer these programs involve in developing and advancing the quality of education in the country, which is consistent with previous studies in respect of providing support for education (McKenzie et al., 2000). Additionally, Dooley and Murphrey (2000) reported that using new technologies to enhance the quality of education, opportunity for collaborations with other institutions, facilitating access for students, administrative assistance, and getting support for educational design were motivational factors to make them begin or continue distance education. As a result, the research findings are parallel to the literature under the headings of job satisfaction, additional income, and support for education. This study additionally revealed that demands of prospective students, gaining prestige, and need of classroom space or teaching staff are also contributing motivational factors with regard to distance education. Since the earlier studies were focused on only distance education in the abstract, but not online academic degree programs, this study more specifically explored administrator motivation for offering online associate degree programs, online master's degree programs, online bachelor's degree completion programs, and online bachelor's degree programs in universities. As for the newly discovered factors in the study, they are likely due to the growth in prospective students in education in the country, current competition for student retention, which is fostered by the pursuit of prestige among universities, and the increased need for classroom space and the potential need for teaching staff.

Suggestions

It is obvious that online academic degree programs at Turkish universities are mainly shaped by prospective students' demands through the diffusion of popular online programs, rather than in

accordance with academic expectations. Thus, the policies should be reviewed and audited to ensure that online academic degree programs clearly lay out academic expectations for enrolled students. Although universities offer some mission-related online courses, they are often considered as unprofitable or not practical. In fact, universities find it is not cost-effective to set up new infrastructure for distance education or, for the same reason, they do not want to develop online academic degree programs, which attract less students. Bates (2000) suggests that institutions can share the costs and increase benefits through collaboration. Decision makers can establish mutual organizational structure and enhance the cooperation between universities in such a way that the cost of producing content can be reduced. Bates also underlines the importance of developing a dedicated policy for administrative and academic procedures. Policy makers and program leaders should therefore structure the procedures for initiating online academic degree programs in such a way that expectations are definitely delineated in accordance with the country's educational goals. As previously mentioned, there are no other studies about administrators' motives for offering online academic degree programs in universities. In fact, the earlier studies have a tendency to identify a limited view of institutional motivational factors with regard to distance education in the abstract, but not directly online academic degree programs. Therefore, this study can be regarded as a significant contribution to the field, as it provides researchers with detailed tables of motives in offering online academic degree programs, which may have implications for use in future studies, can assist policy-makers and program leaders in determining the appropriate policies in planning distance education strategies. Further studies can be conducted to reveal distorting factors influential on offering online academic degree programs, which may provide a holistic perspective to fully understand the research problem.

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Book Review: The Sage Handbook of E-learning Research (2nd ed.)

Editors: Caroline Haythornthwaite, Richard Andrews, Jude Fransman, and Eric M. Meyers (Eds.). (Los Angeles, CA: Sage, 2016, 606 pages)



Reviewed by: Lauren Cifuentes, *Professor and Director of Distance Education and Learning Technologies, Texas A&M University-Corpus Christi*

Anyone interested in gaining insight regarding recent theories, trends, and applications of e-learning, as well as methods for investigating impacts of e-learning pedagogies would appreciate the wealth of ideas presented in *The Sage Handbook of E-Learning Research*, edited by Caroline Haythornthwaite, Richard Andrews, Jude Fransman, and Eric M. Meyers. The authors challenge historical notions regarding how people learn, definitions of literacy, and research methods. They encourage readers to reflect upon and dialog about e-learning issues. Countless examples of studies are summarized and referenced. The book will prove useful to educators in many arenas. Digital practice administrators, instructors, and researchers will gain insight, and doctoral students will benefit from the authors' perspectives that may be fresh and beyond the scope of their studies within their institutions. In addition, I argue here that, given the ubiquity of online tools and information, the book is a must-read for any administrator, instructor, or student of education who wants to more deeply understand current learning ecology.

Reading the book in its entirety reveals consistency among authors regarding theory to frame research as well as methods that apply. Broadly speaking, each places e-learning in the realm of socio-technical practice and connectivity among people, networks, ideas, cultures, learning contexts, and resources. Authors encourage explorations of the role that communicative artifacts and contexts play in formal and informal educational settings, framing such explorations in materiality. Throughout the book, authors encourage use of analytics to facilitate broad adoption of action research methods and explorations of data driven program evaluation and formative and summative learner assessments. Most authors touch on ethical concerns in the digital age. The book is divided into seven parts: *Introduction, Theory, Literacy and Learning, Methods and Perspectives, Pedagogy and Practice, Beyond the Classroom, and Futures*. Each part focuses on creating for the reader a "coherent view of what constitutes research in the field" (p. 3).

Chapter 1 provides a comprehensive introduction to topics covered in subsequent chapters. In chapters 2 to 5, authors reference theories including socio-technical, socio-political, socio-material, social literacy,

actor-network, communities of practice, cultural historical activity, connectivism, critical, and sociocultural practice variation. These theories share the perspective that “learning occurs when knowledge is actuated through the process of a learner connecting to, and providing information in, a networked learning community” (p. 45). Technologies play important roles in expanding learning communities by creating and shaping complex patterns of mobility, connection, interaction, and collaboration, and providing for powerful ubiquitous learning in a broad learning ecology. In chapter 4, authors present three criteria for a theory of mobile learning. These criteria may be applied by researchers to better understand the impacts of any technology: “distinguish what is special about mobile learning compared to other types of learning activity” (p. 64), “embrace the considerable learning that occurs outside offices, classrooms, and lecture halls” (p. 65), and “take account of the ubiquitous use of personal and shared technology” (p. 66). Current technologies open the door for research that explores

how learning can be transformed for the mobile age through a dialogue between two worlds of education: one in which knowledge is given authority through the curriculum, the other in which it emerges through negotiation and process of coming to mutual agreement (p. 78).

Digital tools for writing and reading are changing definitions of literacy. Definitions of literacy discussed in chapters 6 to 10 extend the old-fashioned definition of literacy as the ability to read and write to include multi-language reading, writing, and teaching with games, screens, online environments, visuals, media, information, and digital tools. Each author in part III focuses on the value of social interaction and learning involvement in active meaning-making. A proficiency described in an operational definition of literacy is ability to establish cognitive, social, and teaching presence in asynchronous discussions. And authors of chapter 7 make the case for curricular incorporation of games rather than gamification. They propose studying games as cultural forms in their own right, just as literature, film, and other art forms might be studied. Authors suggest that media literacy, including game literacy, has three aspects: cultural, critical, and creative. The motivational benefits of games can lead to high levels of engagement; virtual learning environments afford new opportunities for immersing learners in student-centered, collaborative problem-solving, and can be designed to incorporate substantial guidance and require scaffolded self-regulation on the part of learners.

Chapters 11 to 15 provide descriptions of different research methods and examples of studies in which researchers apply those methods. The authors emphasize non-experimental methods given the significant variation in characteristics of learners and quality, genre, and complexity of e-learning materials. For instance, ethnographic approaches focus on “the particular, the emergent, the material, and the situated – elements of the complexity of this phenomenon [of packaged, endlessly transferable, instructional objects] that closed instrumental methods struggle to capture” (p. 294). Similarly, anthropological methods and phenomenography focus on social systems rather than skills frameworks providing for deep understanding. In social network analysis (SNA) researchers focus on connectivity between people and take a relational approach to explore nodes, relations, ties, and networks. Diagrams representing whole networks indicate density of interactions, path lengths, cliques, and structural holes. Connectors among people, ideas, and resources are interpreted. Such studies are used to design interventions, find activity antecedents, predict learning outcomes, and understand the nature and meaning of learning ties. Longitudinal multimodal journaling and discourse analysis are provided as example approaches to robust data analysis. All of chapter

12 is devoted to learning analytics and other chapters describe research that benefitted from existing data sets to explore correlations, association rules, and sequential patterns in big data.

Inquiry about e-learning literacy and designs, social media, games, virtual worlds, and lifelong learning beyond the classroom in open educational resources, libraries, and museums are addressed in chapters 16 to 25. Authors emphasize that beyond brick-and-mortar or virtual classrooms, methodologies that capture the dynamic and collaborative aspect of interactions between and among learners are required for researchers to identify and analyze learning processes in such environments: “As our world becomes increasingly interconnected and information-rich, people are using online environments and tools to reach out and connect in new and powerful ways” (p. 354). Cultures of participation, sharing, openness, and collaboration are at the forefront of learning environments that bridge social relationships and communities with resources, knowledge, and information. Authors in these chapters call for new theories to underpin participatory pedagogy, defined as “forms of learning and teaching that harness the use of digital media and participatory cultures and action” (p. 416). New pedagogies would acknowledge the importance of preparing learners to be media managers and producers “in the development of voice, agency, personalization and an ethical stance to their own practices” (p. 416).

In the final book chapter, “The Future of E-learning,” the authors define e-learning as “a combination of methods, structures and networked electronic tools orchestrated into systems that bring about, or are intended to bring about, learning” (p. 537). The authors emphasize that research on e-learning explores human systems of activity rather than electronically driven activity. We are in the era of connectivist pedagogies with distributed and networked learning and knowledge. On page 544, the authors make a surprising and insightful statement regarding the fundamental difference between online and face-to-face education that must be considered as the context for e-learning research. They proclaim that a shift in control from instructors to learners is the fundamental difference. Given the age-old suggestion that learners control their own learning, this statement should excite educators regarding the potential for e-learning: “On the Internet, almost everyone is a teacher and everyone is a learner, whether intentionally, effectively, accurately, reliably, or not” (p. 538). Taking advantage of increased learner control and flexibility will be facilitated by the eight e-learning pedagogies enumerated in this final chapter. In addition, the authors predict six elements and characteristics of future pedagogy: It will be focused heavily on the individual learner; distributed, technically, socially, and organizationally; crowd-driven and emergent; and integrated, just-in-time, and authentic. Courses will have a less significant role, and learning will be divorced from accreditation.

Authors of chapters in *The Sage Handbook of E-learning Research* celebrate the changes that e-learning has brought to formal and informal education. What the book lacks is exposition on theories and research on the effects of new technologies on human development, learning, and the brain. In the next edition, and I do hope there will be another edition, I would like to see discussion about potential societal dangers and limitations of social media and how to mitigate them in formal and informal learning environments. Inclusion of authors who explore the impacts of new media and the critical role that education plays in preparing users to be able to evaluate what may be controlling our thoughts would be appropriate. Explorations of human interactions with technology’s impacts on social change and how to design experiences that empower learners to be critical users of technologies would be of value. E-learning

educators and researchers would be well advised to facilitate critical thinking concerning the various media bombarding all of our nervous systems. Authors such as Susan Greenfield, Sue Halpern, Nicholas Carr, Richard Andrews (an editor of this book), and David Staley have explored how “the body, in collaboration with its tools, can act on the environment and engender new ways of thinking” (p. 11). Both positive and negative impacts might be explored in another edition of a handbook of e-learning.

The Handbook provides for widening understanding of learning technology as socio-cultural practice anywhere and anytime. In the interest of understanding the complexity of the learning landscape, emerging theories explored in the book continue to replace behavioral, cognitive, and constructivist theories and challenge the usefulness of positivist research and teaching methods. I highly recommend this resource for educators and researchers. Each chapter provides something new and interesting, and as a whole the book provides a foundation of theories that frame research and methods for exploring e-learning. Academic Affairs level administrators who read this book would better understand the influence of new technologies that are driving learning experience beyond the realm of their educational institutions and their shared-governance structures. New technologies empower learners to take control of their own learning. How educational institutions respond to this shift in control is a significant, tacit question raised throughout *E-learning Research*.

