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Editorial – Volume 22, Issue 1

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Welcome to our first issue of 2021! I want to start off by noting that last year *IRRODL* marked its 20th anniversary with its first issue coming out in June 2000. The Editor at the time was Peter Cookson who was Professor of Distance Education and Associate Vice President, Academic at Athabasca University. He wrote about the aspirations of the journal in that very first editorial. He emphasized that *IRRODL* is a "… journal in which readers can inform themselves about distance education developments in theory, research, and best practice. Our aim is to have all three elements present in every issue." I believe this is something that has been achieved for every issue these last two decades including this issue. To help us celebrate, we have included a special commissioned article by **Debra Dell** that provides an integrative-retrospective analysis of highly-cited articles from past issues (2000–2020) of this journal. A top 10 most cited list of *IRRODL* articles is presented which is then used to identify themes to frame a discussion of the key topics in present-day online and distributed learning research and pedagogy. We have kept this article as the final contribution to this issue as sort of icing on our 20th anniversary cake. However, before you go there, I want to draw your attention to the other layers (submissions) in this cake (issue).

In our first paper, **Datt** and **Singh** explore learners' awareness of, and satisfaction with, the e-services provided at an open university showing that gender, age, and education level were influential. For example, learners with higher maturity and education levels were more aware of available services.

Cheng, **Liao**, and **Yu** present a study of 5th grade students in an online group study robotics course, which increases participant reasoning, probabilistic reasoning, and ability to analyze a problem. The learning environment created combines real-world and digital-world resources, and can enhance the effectiveness of learning among students from a remote area.

In the following study, **Luik** and **Lepp** explore the main motivation clusters of participants in a computer programming MOOC, to compare how these clusters differed in terms of intention to complete versus actual completion rate. Interestingly, the completion rate was the lowest in the over-motivated cluster.

Olatunji and **Adebisi** offer a direct comparison of single- and dual-mode institutions by examining the similarities and differences in the processes and facilities for distance education at the National Open University of Nigeria and Obafemi Awolowo University, Ile-Ife. The study emphasized the universal value of blended learning and promoting ICT-driven distance education.

We are then provided with a cross-institutional evaluation and analysis of a pilot implementation of open educational resources across multiple disciplines by **Oelfke**, **Sadowski**, **Ramseier**, **Iremonger**,

Volkert, **Dykman**, **Kuhl**, and **Baumann**. The survey considered creation and implementing courses (faculty), as well as perspectives on their benefits and use (students).

In the next article, **Refae**, **Kaba**, and **Eletter** investigate the impact of demographic characteristics on academic performance in comparing face-to-face with distance learning. Student performance in distance learning was found to be better and the authors suggest distance learning be considered as a component in any learning program.

Amzalag and **Shapira** demonstrate ways that online contact can be used to promote acquaintance and reduce stereotypes and prejudices among teachers from different groups in Israeli society. Findings indicated that upon program completion, participants were more respectful towards one another and open to multiculturalism than pre-program.

First-generation students in distance education programs may be at particular risk of lacking the necessary social capital to thrive in university. **Brubacher** and **Silinda** suggest that university guidance from family members may actually serve as a protective factor against potential challenges that can impact students' academic adjustment, a protective factor that first-generation students are less likely to have.

In the following study, **Li** and **Wang** examine the return to distance higher education by students in different academic disciplines. While return rates in face-to-face higher education are generally higher some differences could be explained by factors like labour market or disciplinary considerations (e.g., availability of laboratories).

With last year's arrival of COVID-19, the approach to open and distributed learning has been of significant relevance globally. These last three research articles may be of particular interest to our colleagues new to moving beyond just in-person classroom activities. First, data results in this next study can be considered good news for many educators during the pandemic attempting to determine if students would be put at a disadvantage by using one learning mode instead of another. **Griffith**, **Faulconer**, and **McMasters** report no significant difference regarding end of course grades, grade distribution or pass rates between online, video synchronous learning (classroom and home), or traditional classroom. Then, to aid designers, teachers, and users, **Marciniak** and **Rivera** present and validate a system, comprising of 43 assessment indicators, designed to evaluate the quality of online didactic materials and guide both in their creation and selection. Finally, **Kamble**, **Gauba**, **Desai**, and **Golhar** endeavor to understand the perceptions of learners at a university in India in the context of the sudden transition from traditional face-to-face learning to an instructor-led online learning environment (OLE). The study provides some initial practical insight and context around issues including infrastructure readiness for remote learners, acceptance, and adoption of OLE by faculty instructors, organizational support, and facilitating conditions.

The subsequent contribution comes to us as a book review. It will encourage those *IRRODL* readers interested in massive open online courses (MOOC) to think about them more deeply and internationally (particularly outside the global North). **Perris** provides us with an outstanding review and summary of the edited book, *MOOCs and Open Education in the Global South: Challenges, Successes and Opportunities* (Zhang, Bonk, Reeves, & Reynolds, 2020).

Lastly, we are provided a strong close to this issue with two thought-provoking *Notes From the Field*. First, **Keshavarz** and **Ghoneim** describe building a MOOC course for educators in Austria and the development of medical education for universities in Iran using Tony Bates' open book, *Teaching in a Digital Age: Guidelines for Designing Teaching and Learning*, as their inspiration and guide. Second, as stated earlier, **Dell** provides us with that icing to the journal's anniversary cake with an excellent look back at the popular (most downloaded) *IRRODL* articles. It is both a meaningful retrospective for the seasoned distance educator, as well as a broad overview that will be of interest to those who are new to the field of online learning. Enjoy and Happy 20th Anniversary *IRRODL*!

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Learners' Satisfaction With the Website Performance of an Open and Distance Learning Institution: A Case Study

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Abstract

This paper explores learners' awareness of and satisfaction with the e-services that an open university provides its learners through its Website. The paper further highlights the influence of age, gender, and education levels on learners' awareness and satisfaction levels. A case-study approach was adopted and an online survey was used to collect data from learners in various programs of study at Uttarakhand Open University, India. The questionnaire measured the awareness levels of learners regarding 15 frequently used e-services and their satisfaction levels with the 12 most frequently used e-services that the university offers. Results show that gender, age, and education level have a significant influence on the awareness and satisfaction level of the participants. When maturity level and education level of the participants increased, they are more aware of the e-services provided by the University. In some cases, up to 58% of users were unaware of the university's e-services, and a large number of respondents were either dissatisfied with or undecided regarding the university's e-services. Results indicate that infrastructure is required for learners' optimal use of information and communication technology and the e-services that the university offers, including the provision of Internet connectivity at all of the university's learning support centers.

Keywords: e-services, Website, open and distance education, ODE, learner satisfaction, open university

Introduction

The Website of any open university is the most common medium for distributing information among current and prospective learners. The use and importance of Websites is increasing with the global reach of the Internet. In the open and distance learning (ODL) approach to education, in contrast to conventional or traditional methods, learners and the teachers are geographically separated; and learners must learn independently, using information and communication technology (ICT; Sahusilawane & Hiariey, 2016). The Website of any ODL institution plays an important role in bridging this gap. The university Website is an information gateway for its users. Open university Websites are more advanced than the Websites of other educational institutions because the open university Website acts as a one-stop resource through which several learner support services are launched, such as online admissions; notices and announcements; student records; online examination forms; e-learning portals; evaluation results; and complaint, query, and grievance registration. This study aimed to identify open university learners' awareness of and satisfaction with the e-services that the university provides through its Website.

The Internet has made access to information and the distribution of educational content available to a large portion of the world's population. It has also helped move distance education into the digital era (Fidalgo et al., 2020). ODL has become an integral part of the teaching-learning process in higher education. e-Learning is becoming a popular medium because of its efficiency in providing education at lower costs and with easy access at any time and anywhere. In the ODL system, educational opportunities are deliberately planned so that education is available to large parts of society and can reach the remotest locations of a region. This system also helps overcome many of the problems involved in the traditional education system, such as a lack of classrooms, lack of quality education, and faculty shortages, among others. The ODL system is an opportunity for learners who are unable to join traditional classrooms for a variety of reasons and has great potential to increase the inclusivity of education because of its flexibility and distinctive user-friendly character. Furthermore, education prepares learners to be more productive and competent in the harsh competition of the global economy; and the ODL system can serve as a platform to pursue new levels of qualification and enhance learners' skillset and knowledge.

Table 1

Total Number of Individual Internet Users Worldwide (2001–2018)

Year	Internet users (in millions)	Internet users per 100 inhabitants
2001	495	8.0
2002	677	11.0
2003	785	12.0
2004	914	14.0
2005	1,100	16.8
2006	1,216	18.4
2007	1,382	20.6
2008	1,570	23.1
2009	1,772	25.8
2010	2,035	29.3
2011	2,242	31.8
2012	2,478	34.8
2013	2,669	37.0
2014	2,853	39.1
2015	3,060	41.5
2016	3,345	44.8
2017	3,701	49.0
2018	3,924	51.4

Note. Based on data from the International Telecommunication Union (https://www.itu.int/en/ITU-D/Statistics/Pages/default.aspx)

Table 1 presents the number of individual Internet users worldwide (in millions) and individual Internet users per 100 inhabitants from 2001 to 2018. As the table shows, there has been significant growth in the number of Internet users in the past 18 years. In the 21st century, digital presence and e-services are key to achieving success. The Internet, in its diverse forms and features (e.g., accessibility, availability, and popularity) plays a central role in many businesses worldwide, and the importance of online presence is significant. Most higher education institutions have a notable Web presence; and information related to courses, prospective students, news and events, and other topics can be easily accessed by visitors to the Website (Manzoor et al., 2012). The Web-based visibility of an ODL institution has several advantages over physical or local visibility, because the accessibility of services is central to the ODL approach. In addition, social media performs a key role in popularizing social organizations and even academic relations in educational institutions (Permatasari et al., 2013).

The Internet is a prominent medium that ensures the instant delivery of information to target audiences. The Web-based information delivery system facilitates various innovative methods for teaching, learning, and managing administrative records and drives competition among ODL organizations in terms of the e-services they provide through the Internet.

In 21st century education, the role of ODL has changed. A paradigm shift has occurred because of the unprecedented development of Web-based technologies, especially the advancements in computer-based teaching and learning and instant information delivery and communications (e.g., virtual classes, forums, and online learning, as well as video and audio archives, and e-content). In this context, the Website of any educational institution is a key resource for prospective learners to learn about the institution and prepare themselves accordingly and for learners enrolled in the institution to access the

information and services they need to succeed. Satisfaction with these services from the viewpoint of their users is key for any organization. Identifying learners' satisfaction with the performance and usability of the university's e-services can help universities improve their offerings over time (Islam & Tsuji, 2011).

Usability of the Websites of Higher Education Institutions

According to the guidelines of the Distance Education Bureau in India, in order to provide effective student support services and quality education, ODL institutions should have a dedicated Website for its ODL system, regularly update its technology, and introduce new technological innovations (Distance Education Council, 2009). The ideal Website of an ODL institution, and the e-services provided through it, is a reflection of current and prospective learners' needs. However, Website design is often driven by available technology and business objectives, though usability is gradually gaining in importance. There are several methods to assess the usability of Websites, such as heuristic methods, prototyping, cognitive walkthroughs, and questionnaires, among others (Mustafa & Al-Zoua'bi, 2008). Website usability can also be studied from different perspectives and different usability assessment tools can be used. Website designers and developers can use the results of such assessments to improve the Website (Chiew & Salim, 2003).

Numerous studies have been conducted on the usability of the Websites of higher education institutions. These studies conclude that university Websites should include relevant content for users, be maintainable, have an efficient structure, and provide contact information, among other features (Islam & Tsuji, 2011; Mentes & Turan, 2012; Roy, Pattnaik, & Mall, 2014, and Jabar, Usman, & Awal, 2013). Islam and Tsuji (2011), in their study of the usability select university Websites in Bangladesh, found that the overall usability of the Websites was unsatisfactory; though a few of the Websites were satisfactory in terms of the available features (e.g., educational information and user interface design). Among the weaknesses found were poor structural design and interface and performance issues. In a study of the usability of Namik Kemal University's Website in Turkey, Mentes and Turan (2012) used the Website analysis and measurement inventory (WAMMI), which measures Website usefulness and its ease of access. WAMMI is based on five factors: attractiveness, controllability, efficiency, helpfulness, and learnability (Mentes & Turan, 2012). It has been concluded in the study that the website is having key role in establishing a healthy communication between the university and its stakeholders.

Other studies have focused on usability from a user's perspective. Jabar et al. (2013) explored the perspectives of 364 university learners on the usability of university Websites and investigated whether the learners' areas of specialization had impact on the perceived usability of the Websites. They concluded that usability factors (i.e., attractiveness, controllability, helpfulness, efficiency, and learnability) must be given more consideration when designing educational Websites. In a quantitative study of the usability of academic Websites from a user perspective, Roy et al. (2014) employed both questionnaire- and performance-based methods. Participants were asked to perform a task on a university Website and then complete a questionnaire. Data was collected on observed task success rates and task completion times, as well as participants' post-task satisfaction levels and their feedback on the Website's usability. The impact of task completion times on participant's satisfaction levels was also explored. This study shows that the multiple language supports in sharing information and less response time are the effective usability factors which satisfy its users (Roy, Pattnaik, & Mall, 2014). Hasan's (2014) study on the usability of educational Websites based on student design preferences found that learners preferred design category was Website content followed by navigation, while

organization was considered the least important to them. It is important to note that there was a statistically significant difference between male and female students regarding the Website content and its navigation. In another study, Undu and Akuma (2018) investigated the usability of the Benue State University Website from a users' perspective. The university Website is used to communicate with learners and offers computing services. Undu and Akuma concluded that the university Website had a neutral usability level because of the usability issues found in the study. Inconsistence in design and layout of web pages, dismay with the website navigation, controllability, and inappropriate labelling of the navigation menu are some of the usability issues found in the study.

Garett et al. (2016), in their review of literature on Website design and user engagement, identified eight key elements of effective Website design, including navigation, graphical representation, organization, content utility, purpose, simplicity, and readability. Garett et al. also suggest that before designing a Website, one should decide on the priorities and objectives of the Website based on its field. For example, a Website related to online business seeks to optimize brand, loyalty, profit, and smooth and fast page loading; while an academic Website seeks content accuracy, privacy, publicity for academic achievements and success, and availability of important information for prospective users. To develop an attractive and interactive Website for an academic institution, structural planning, quality content, and useful information for potential users are key factors. Keyword search and navigation links or menus are in high demand among users of the academic institution Website (Raduica et al., 2019).

Various studies have been conducted to identify and assess the perceptions of learners on e-learning and the performance of online services that ODL institutions offer their learners. The review of literature conducted for this study revealed that most studies on the use of ICTs or ICT interventions in ODL were conducted before the COVID-19 pandemic. Learner satisfaction with the performance of ODL institution Websites has yet to be studied during the COVID-19 pandemic, when the role of ICTs in disseminating knowledge through e-learning has become a necessity. This study addressed the research gap by conducting this study during the COVID-19 pandemic. Due to the lockdown across the country, people everywhere are required to stay at home. In situations like this, the use of ICT plays a key role in disseminating knowledge and information amongst its seekers. Therefore, we conducted this study to explore learner satisfaction with the website performance of an open and distance learning institution during this period of time. We investigated both the opportunities available to and challenges faced by users of ICT during the COVID-19 pandemic. The results of this study will assist policy makers and the various service providers who offer services through ICT. We explored learner satisfaction with the performance of an ODL university's Website in India during the COVID-19 pandemic, in terms of the e-services that the university provides through the Website and the Website's visibility. The study also investigated learners' perceptions of the usability of the Website and the e-services, which include information about the university, links to admission processes, counselling session scheduling, examination forms and announcements of results, access to transcripts and degree certificates, and learner grievance procedures, among other services. Suggested measures to improve and enhance the usability of the university Website are made based on the study results. The results of this study may be useful to distance education institutions or universities that offer their programs of study through ICTs, especially during a crisis, such as the COVID-19 pandemic.

Research Methodology

Employing a case-study approach, this study was conducted at Uttarakhand Open University in India and assessed learners' satisfaction with the performance of the university's Website and e-services, their awareness of the university's e-services, and their perception of the Website's usability. Data was collected from primary as well as secondary sources. Primary data was collected from learners enrolled in the Uttarakhand Open University using an online survey questionnaire; and secondary data was collected from relevant literature and Websites, publications, reports and records from the International Telecommunication Union (ITU), the Uttarakhand Open University, distance education institutes, the University Grants Commission, the Ministry of Human Resource Development, the Distance Education Council, and the Distance Education Bureau in India. All data were statistically analyzed. Learners' awareness of and satisfaction with the university's e-services were analyzed based on gender, age, and education levels.

Data Collection

An online questionnaire was used to collect data from learners at Uttarakhand Open University. The questionnaire comprised 36 questions and was organized in three sections: The first section focused on general demographic information, including participants gender, age group, highest level of education, occupation, and employment status and the devices used to access the university Website. The second section included questions about the learners' awareness of 15 frequently used e-services that the university provides, to which participants responded "yes" or "no." The third section included questions about learners' satisfaction with the 12 most frequently used e-services, to which participants responded using a five-point Likert scale.

The questionnaire was sent via e-mail, WhatsApp, and other social media platforms (i.e., departmental blogs, University website, Facebook, and University e-learning platforms) to more than 220 potential participants across the region. The survey was available for 25 days. A total of 153 participants completed the questionnaire within the designated 25-day period. Survey participants were selected based on convenience random sampling, with the following criteria in mind, age group, education level, occupation, and employment status, among others. The study was restricted to learners from the Uttarakhand Open University who were either enrolled at the university at the time of the study or had graduated or dropped-out.

Table 2

The Demographic Profile of the Participants

Variable	Description	*n*	%
Gender	Male	73	47.7
	Female	80	52.3
Age group	19 to 25 years	56	36.6
	26 to 35 years	73	47.7
	36 to 45 years	24	15.7
Education level	12th grade or equivalent	18	11.8
	Undergraduate degree or equivalent	30	19.6
	Master's degree or equivalent	99	64.7
	PhD	6	3.9
Employment status	Employed	93	60.8
	Unemployed	60	39.2
Devices used to access Website	Desktop computer or laptop	40	26.1
	Android-based mobile phone	113	73.9

Note. N = 153.

Table 2 presents the demographic profile of the participants: There were more female participants (52.3%) than male participants (47.7%). Close to half of the participants (47.7%) were in the 26 to 35 years' age group 36.6% were in the 19 to 25 years' age group, and 15% were in the 36 to 45 years' age group. More than half of the participants (64.7%) had completed a master's program or its equivalent, 19.6% participants had completed an undergraduate program or its equivalent, 11.8% of participants had completed grade 12 or its equivalent, and 3.9% participants had PhDs in different disciplines. More than half of the participants (60.8%) were employed, whereas 39.2% were unemployed. Many participants (73.9%) used android-based mobile devices to access the university Website and e-services, while 26.1% used a desktop computer or a laptop.

Results and Discussion

Learners enrolled in various programs of study at the Uttarakhand Open University, India participated in this study of their awareness of and satisfaction with the university's Website and e-services. This section is comprised of awareness based from the participant's gender, age, and education level, as well as, the satisfaction level of the selected participants for these categories. The majority of participants were unaware of the e-services/facilities provided by the University to their learners. In the 2018–2019 academic year, online enrollment comprised 50.74% (28,392 learners) of total admissions to the university; whereas, in the 2019–2020 academic year, online enrollment reached 83.53% (59,568) of total admissions (Uttarakhand Open University, 2020). These rates demonstrate the substantial use of the Website by learners at the university. Therefore, ODL institutions, such as Uttarakhand Open University, should have an easily accessible Website.

Learners' Awareness of the University's e-Services

This section is comprised of learner awareness of University e-services based on their gender, age, and education level. Accessing examination results and notices/announcements were the top e-services in which most of the learners were satisfied.

Learners' Awareness by Gender

Table 3 and Figure 1 present the results of the analysis of learner awareness of the university's e-services based on participants' gender. Results show that the majority of learners (both male and female) were unaware of many of the e-services that the university provides through its Website. This result is surprising and should be of great concern to the university. Plans are needed to address the learner awareness-related shortcomings of the university's Website.

Table 3

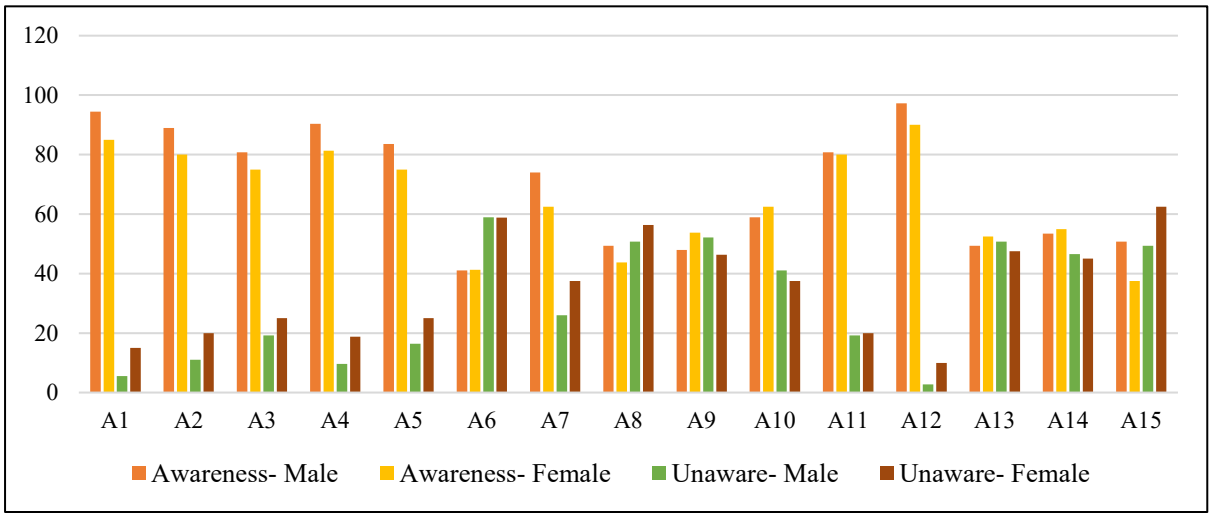
Learners' Awareness of the University's e-Services by Gender

e-Services awareness indicators[a]	Male learners (%)		Female learners (%)	
	Yes	No	Yes	No
A1	94.5	5.5	85	15
A2	89	11	80	20
A3	80.8	19.2	75	25
A4	90.4	9.6	81.3	18.8
A5	83.6	16.4	75	25
A6	41.1	58.9	41.3	58.8
A7	74	26	62.5	37.5
A8	49.3	50.7	43.8	56.3
A9	47.9	52.1	53.8	46.3
A10	58.9	41.1	62.5	37.5
A11	80.8	19.2	80	20
A12	97.3	2.7	90	10
A13	49.3	50.7	52.5	47.5
A14	53.4	46.6	55	45
A15	50.7	49.3	37.5	62.5

[a] e-Services awareness indicators A1–A15 are presented in Appendix A.

Figure 1

Learners' Awareness of the University's e-Services by Gender



A small percentage of learners (15% of female learners and 5.5% of male learners) were unaware of the university Website's name (A1); 20% of female learners and 11% of male learners were unaware of the link to online admissions available on the home page of the Website (A2); 25% of female learners and 19.2% of male learners were unable to find a valid study center on the university Website (A3); 18.8% of female learners and 9.6% of male learners were unaware of the notices and announcements published on the university Website (A4); and 25% of female learners and 16.4% of male learners were unaware of the link to Student One View, an information center for student records, which is available through the university Website (A5).

In addition, 58.9% of male and 58.8% of female learners were unaware of the link to the university's recognition letters, which is available on the Website (A6); 37.5% of female learners and 26% of male learners were unaware that they could complete an online examination/back form (additional chance to improve the score attained) application through the Website (A7); and 56.3% of female learners and 50.7% of male learners were unaware of the link to the university's e-learning portal (A8). As e-learning is one of the main pillars of the ODL system, this result raises concern and should be addressed by policymakers and implementation units at the university. In addition, the university has a database with a large number of video-recorded lectures for learners, but only 53.8% of female learners and 47.9% of male learners were aware of the link to the lectures on the university Website (A9). Furthermore, only 62.5% of female learners and 58.9% of male learners were aware that they could access e-SILM (Electronic-Self Instructional Learning Material; A10) from the university Website.

Some learners (20% of female learners and 19.2% of male learners) were unaware that they could access old question papers (question papers of previously conducted examinations; A11) through the university Website. However, most learners (97.3% of male learners and 90% of female learners) were aware that they could download and/or view evaluation results through the Website (A12), a positive sign for the university; while 50.7% of male learners and 47.5% of female learners were unaware that they could register complaints, queries, and grievances through the Website (A13); and 46.6% of males and 45% of female learners were unaware that they could access a link to the university's mobile application on

the university Website (A14). The Frequently asked questions (FAQs) feature, which is important to any online service or Website and makes it easier for users to navigate the Website and access the e-services, answers many of the salient questions that visitors to the Website may have. However, more than half of female learners (62.5%) and 49.3% of male learners were unaware of the FAQs available on the university Website (A15).

Learners' Awareness by Age Group

Analysis of learners' awareness by age group revealed that the majority of learners in the different age groups (62% of learners in the 19 to 25 year age group, 54% of learners in the 26 to 35 year age group, and 62% of learners in the 36 to 45 year age group) were unaware of the university's recognition letters (A6) , the link to the e-learning portal (A8), and the FAQs (A15); however, all age groups were aware of the online admissions (A2), access to evaluation results (A12), and Student One View (A5; see Table 4 and Figure 2). Results show that there is an urgent need to improve the visual clarity and presentation of information on the Website, especially with respect to the e-learning portal and the recognition letters, to increase learner awareness about the important information and e-services available through the Website.

Table 4

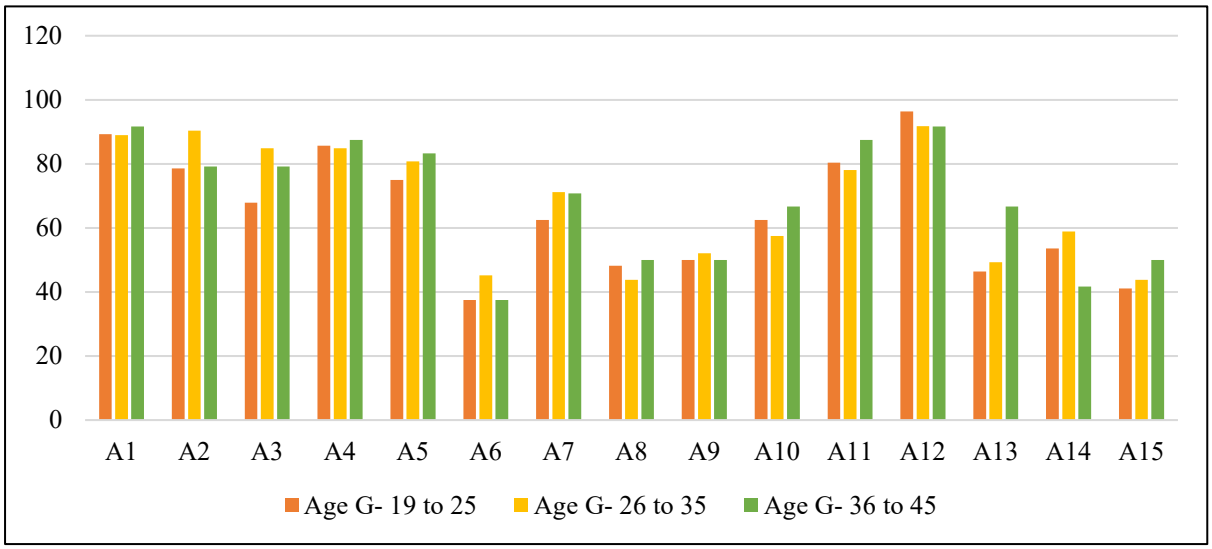
Learners' Awareness of the University's e-Services by Age Group

E-services awareness indicators[a]	19 to 25 years (%)		26 to 35 years (%)		36 to 45 years (%)	
	Yes	No	Yes	No	Yes	No
A1	89.3	10.7	89	11	91.7	8.3
A2	78.6	21.4	90.4	9.6	79.2	20.8
A3	67.9	32.1	84.9	15.1	79.2	20.8
A4	85.7	14.3	84.9	15.1	87.5	12.5
A5	75	25	80.8	19.2	83.3	16.7
A6	37.5	62.5	45.2	54.8	37.5	62.5
A7	62.5	37.5	71.2	28.8	70.8	29.2
A8	48.2	51.8	43.8	56.2	50	50
A9	50	50	52.1	47.9	50	50
A10	62.5	37.5	57.5	42.5	66.7	33.3
A11	80.4	19.6	78.1	21.9	87.5	12.5
A12	96.4	3.6	91.8	8.2	91.7	8.3
A13	46.4	53.6	49.3	50.7	66.7	33.3
A14	53.6	46.4	58.9	41.1	41.7	58.3
A15	41.1	58.9	43.8	56.2	50	50

[a] e-Services awareness indicators are presented in Appendix A.

Figure 2

Learners Awareness of the University's e-Services by Age Group



Note. Age G. = Age group.

Learners' Awareness by Education Level

This section comprised of learner awareness of University e-services based on their education level. The majority of the learners were found to be unaware of the e-SILM, recognition letters, and FAQs.

Analysis of learner awareness by their education level shows presented in Table 5, shows that learners with a grade 12 education, an undergraduate degree, and a master's degree, as well as PhD scholars (66% of learners with a grade 12 education; 66% of learners with an undergraduate degree, 55% of learners with a master's degree, and 50% of learners with a PhD) were all unaware of the university's recognition letters (A6). They were also unaware of the link to e-SILM (A10) and FAQs (A15) available on the university Website. Therefore, the university should work on the visual clarity and presentation of this information to increase learners' awareness of the important information and e-services available through the Website.

Table 5

Learners' Awareness of the University's e-Services by Education Level

e-Services awareness indicators[a]	12th grade or equivalent (%)		Undergraduate or equivalent (%)		Master's or equivalent (%)		PhD (%)	
	Yes	No	Yes	No	Yes	No	Yes	No
A1	83.3	16.7	83.3	16.7	92.9	7.1	83.3	16.7
A2	83.3	16.7	70	30	88.9	11.1	83.3	16.7
A3	50	50	76.7	23.3	83.8	16.2	66.7	33.3
A4	61.1	38.9	86.7	13.3	89.9	10.1	83.3	16.7
A5	50	50	80	20	84.8	15.2	66.7	33.3
A6	33.3	66.7	33.3	66.7	44.4	55.6	50	50
A7	55.6	44.4	56.7	43.3	72.7	27.3	83.3	16.7
A8	27.8	72.2	50	50	46.5	53.5	83.3	16.7
A9	50	50	66.7	33.3	46.5	53.5	50	50
A10	44.4	55.6	66.7	33.3	61.6	38.4	66.7	33.3
A11	66.7	33.3	93.3	6.7	77.8	22.2	100	0
A12	94.4	5.6	93.3	6.7	92.9	7.1	100	0
A13	50	50	50	50	50.5	49.5	66.7	33.3
A14	55.6	44.4	73.3	26.7	48.5	51.5	50	50
A15	33.3	66.7	46.7	53.3	43.4	56.6	66.7	33.3

[a] e-Services awareness indicators are presented in Appendix A.

Learner Satisfaction With the University's e-Services

In this section learner satisfaction regarding University e-services based on their gender, age, and education level was analyzed. In the case of frequency of University e-services used, i.e., online admission, online examination form, view/download results, the majority of the learners reported that they were either satisfied or extremely satisfied.

Learners' Satisfaction by Gender

Table 6

Learners' Satisfaction With the University's e-Services by Gender

Satisfaction indicators[a]	level[b]	Participant gender									
		Male					Female				
		(5)	(4)	(3)	(2)	(1)	(5)	(4)	(3)	(2)	(1)
Q1		46	20	5	2	0	35	23	14	2	6
Q2		42	24	6	1	0	42	22	5	6	5
Q3		38	21	11	3	0	38	16	9	11	6
Q4		32	23	10	8	0	36	20	12	6	6
Q5		30	21	20	2	0	27	16	24	10	3
Q6		20	18	27	8	0	19	14	35	9	3
Q7		18	23	24	8	0	10	24	32	11	3
Q8		22	24	22	5	0	21	17	28	11	3
Q9		34	23	12	4	0	32	15	19	11	3
Q10		37	26	6	4	0	33	31	4	9	3
Q11		17	11	19	16	10	15	12	23	17	13
Q12		15	12	30	8	8	17	6	29	19	9

[a] e-Services satisfaction indicators are presented in Appendix B.

[b] Satisfaction levels were measured on a 5 point Likert scale: 5 = extremely satisfied, 4 = somewhat satisfied, 3 = neutral, 2 = somewhat dissatisfied, and 1 = extremely dissatisfied.

Table 6 shows that the majority of male and female learners were extremely satisfied with some of the e-services, such as online admissions (Q1; 90% of male learners and 71% of female learners), online examination forms (Q5; 69% of male learners and 53% of female learners), access to view and/or download evaluation results (Q10; 86% of male learners and 79% of female learners),, that the university offers learners enrolled in various programs of study at the university. However, they were dissatisfied with e-services, such as the e-learning portal (Q6; 11% of male learners and 15% of female learners), video-recorded lectures available through the Website (Q7), access to download e-SILM (Q8), the university's mobile application (Q12), and the university's procedures for handling complaints, queries, and

grievances (Q11).

Learners' Satisfaction by Age Group

Table 7

Learners Satisfaction With the University's e-Services by Age Group

Satisfaction indicators[a]	level[b]	Age Group														
		19 to 25 Years					26 to 35 Years					36 to 45 Years				
		(5)	(4)	(3)	(2)	(1)	(5)	(4)	(3)	(2)	(1)	(5)	(4)	(3)	(2)	(1)
Q1		33	12	7	1	3	34	26	9	3	1	14	5	3	0	2
Q2		34	15	3	2	2	35	24	8	5	1	15	7	0	0	2
Q3		31	13	7	2	3	32	17	12	11	1	13	7	1	1	2
Q4		25	16	8	4	3	32	18	13	9	1	11	9	1	1	2
Q5		20	12	17	5	2	27	19	20	7	0	10	6	7	0	1
Q6		14	10	24	6	2	18	14	30	11	0	7	8	8	0	1
Q7		13	13	20	8	2	12	21	29	11	0	3	13	7	0	1
Q8		16	14	17	7	2	20	16	28	9	0	7	11	5	0	1
Q9		23	14	10	7	2	31	17	18	7	0	12	7	3	1	1
Q10		27	20	1	6	2	32	27	8	6	0	11	10	1	1	1
Q11		9	10	15	13	9	16	9	19	17	12	7	4	8	3	2
Q12		12	7	18	12	7	15	5	33	12	8	5	6	8	3	2

[a] e-Services satisfaction indicators Q1–Q12 are presented in Appendix B.

[b] Satisfaction levels were measured on a 5 point Likert scale: 5 = extremely satisfied, 4 = somewhat satisfied, 3 = neutral, 2 = somewhat dissatisfied, and 1 = extremely dissatisfied.

Results show the majority of the learners across age groups were satisfied with the university's e-services, such as online admissions (Q1; 81% of learners in the 19 to 25 year age group, 82% of learners in the 26 to 35 year age group, and 78% of learners in the 36 to 45 year age group), online examination forms (Q5; 57% of learners having age group of 19 to 25 years, 63% of learners having age group of 26 to 35 years, and 66% of learners having age group of 36 to 45 years), access to view or download evaluation results (Q10); , that the university offers its learners through the Website (see Table 7). But they were dissatisfied with e-services, such as the e-learning portal (Q6; 14% of learners in the 19 to 25 year age group, 15% of learners in the 26 to 35 year age group, and 5% of learners in the 36 to 45 year age group), the video lectures uploaded to the Website (Q7), access to download e-SILM (Q8) and the university's mobile application (Q12), and university procedures for handling complaints, queries, and grievances (Q11).

Learners' Satisfaction by Education Level

Table 8

Learners' Satisfaction with the University's e-Services by Education Level

Education level	Satisfaction level[b]	e-Services satisfaction indicators[a]											
		Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12
12th grade or equivalent	(5)	12	10	7	6	4	5	7	5	5	10	1	3
	(4)	3	6	6	5	5	3	3	5	7	6	4	3
	(3)	1	0	3	4	7	8	6	6	4	0	4	7
	(2)	0	0	0	0	1	1	1	1	1	1	5	3
	(1)	2	2	2	3	1	1	1	1	1	1	4	2
Undergraduate or equivalent	(5)	12	14	14	12	6	4	4	6	9	10	3	4
	(4)	7	9	6	10	4	6	11	7	6	10	4	2
	(3)	7	4	6	3	15	14	8	8	8	2	9	11
	(2)	1	1	2	3	3	4	5	7	5	6	9	8
	(1)	3	2	2	2	2	2	2	2	2	2	5	5
Master's or equivalent	(5)	54	57	52	47	43	28	16	30	49	46	26	24
	(4)	31	29	22	26	26	21	30	27	22	39	14	12
	(3)	11	7	11	14	22	38	40	34	19	8	26	37
	(2)	3	6	12	11	8	12	13	8	9	6	19	16
	(1)	0	0	2	1	0	0	0	0	0	0	14	10
PhD	(5)	3	3	3	3	4	2	1	2	3	4	2	1
	(4)	2	2	3	2	2	2	3	2	3	2	1	1
	(3)	0	0	0	1	0	2	2	2	0	0	3	4
	(2)	0	0	0	0	0	0	0	0	0	0	0	0
	(1)	1	1	0	0	0	0	0	0	0	0	0	0

[a] e-Services satisfaction indicators Q1–Q12 are presented in Appendix B.

[b] Satisfaction levels were measured on a 5 point Likert scale were 5 = extremely satisfied, 4 = somewhat satisfied, 3 = neutral, 2 = somewhat dissatisfied, and 1 = extremely dissatisfied.

Learners with a grade 12 education, with an undergraduate degree, and a master's degree, as well as PhD scholars were dissatisfied with e-services, such as use of the University's mobile app (Q12; 27% of learners with a grade 12 education; 43% of learners with an undergraduate degree, and 26% of learners with a master's degree), and issue with accessing complaint/grievance portal (Q11; 49% of learners with a grade 12 education; 26% of learners with an undergraduate degree, and 6% of learners with a master's degree) whereas Online admission (Q1; 83% of learners with a grade 12 education; 63% of learners with an undergraduate degree, 85% of learners with a master's degree, and 83% of learners with a PhD), and accessing prospectus/Notices/Announcements are the e-services with whom learners were found satisfied during the study. (Q11; see Table 8).

The analyses of learners' satisfaction with the university's e-services show that irrespective of gender, age group, and education level, the university must work to improve the Website's visibility, accessibility, and appeal for all the learners. Learners' dissatisfaction may be related to poor Internet connectivity, which hinders easy access to information and seamless use of e-services. In order to facilitate learners' use of the university's e-resources, such as video-recorded lectures, learning

applications, and other online educational resources, there is urgent need to resolve issues of broadband and network connectivity. Addressing this issue can help learners who reside in the remote areas of the state to participate in e-learning at the university.

Conclusion and Suggestions

The emergence of ICT, and technology-enhanced teaching and learning tools, has changed the ODL system of education around the world. At present, ICTs play a key role in improving and expanding open and distance education worldwide. This study explored learner satisfaction with the website performance of an open and distance learning institution and revealed that, specifically in pandemic times, availability of adequate ICT infrastructure becomes indispensable, especially in the most remote areas of the country. There should be proper internet connectivity at all these areas to ensure e-services to its clientele is effective. The following suggestions to improve the effectiveness of university Websites and e-services in terms of user-friendliness, accessibility, and outcomes are based on the study findings. These recommendations can also be used to enhance the visibility of a university's e-services among learners across the region:

- At the time of admission, the university should provide learners with a list of e-services available through the Website; a user-friendly manual of e-services to guide learners in accessing to the e-services is also recommended.

- The Website design and interface of the university's e-services should not be changed frequently to maintain learners' and visitors' familiarity with the services even after a long period of time.

- Results show that learners were unaware of a number of the e-services that the university offers its learners (see Table 3 and Figure 1). Therefore, more hands-on-training should be provided to raise awareness among the study center coordinators about these e-services. Such hands-on-training is essential because the coordinators are in direct contact with the learners and can familiarize them with the services that the university offers.

- A list of FAQs should be provided to learners at the time of admission to make access to the e-services easier for them.

- Website usability issues, (i.e., ease of use, navigation, and interactivity) were also found during this study (see Table 3 and Figure 1). To resolve such issues, key learner support services should be included on the home page of the Website.

- Results show that a majority of learners were unaware of the useful e-services that the university offers its learners (see Table 4 and Figure 2). To address this issue, learners must have a minimum level of ICT skills and access to the necessary infrastructure so that they can find useful information on the university Website and use these e-services.

- The university can create help manuals and short videos on different e-services to familiarize students and increase their accessibility.

- The university Website and its e-services should be shared on social media platforms that learner and alumni groups, among others, use to increase awareness and popularity.

References

Chiew, T. K., & Salim, S. S. (2003). WEBUSE: Website usability evaluation tool. *Malaysian Journal of Computer Science*, *16*(1), 47–57. https://ejournal.um.edu.my/index.php/MJCS/article/view/6118/

Distance Education Council. (2009). *Recognition of open and distance learning institutions*. Distance Education Council. https://www.ugc.ac.in/deb/pdf/RecognitionODLInstitutionsHandbook2009.pdf

Fidalgo, P., Thormann, J., Kulyk, O., & Lencastre, J. A. (2020). Students' perceptions on distance education: A multinational study. *International Journal of Educational Technology in Higher Education*, *17*, 18. https://doi.org/10.1186/s41239-020-00194-2

Garett, R., Chiu, J., Zhang, L., & Young, S. D. (2016). A literature review: Website design and user engagement. *Online Journal of Communication and Media Technology*, *6*(3), 1–14. https://doi.org/10.29333/ojcmt/2556

Hasan, L. (2014). Evaluating the usability of educational websites based on students' preferences of design characteristics. *International Arab Journal of e-Technology*, *3*(4), 258–269. http://www.iajet.org/documents/vol.3/no.%204/8-58521.pdf

Islam, A., & Tsuji, K. (2011). Evaluation of usage of university Websites in Bangladesh. *DESIDOC Journal of Library & Information Technology*, *31*(6), 469–479. https://pdfs.semanticscholar.org/3df6/15bae95c22964fda5a6c8a11ee7a2b7b04cf.pdf

Jabar, M. A., Usman, U. A., & Awal, A. (2013). Assessing the usability of university Websites from users' perspective. *Australian Journal of Basic and Applied Sciences*, *7*(10), 98—111. http://ajbasweb.com/old/ajbas/2013/August/98-111.pdf

Manzoor, M., Hussain, W., Ahmed A., & Iqbal M. J. (2012). The importance of higher education Websites and its usability. *International Journal of Basic and Applied Sciences*, *1*(2), 150–163. https://doi.org/10.14419/ijbas.v1i2.73

Mentes, S. A., & Turan, A. H. (2012). Assessing the usability of university Websites: An empirical study on Namik Kemal University. *The Turkish Online Journal of Educational Technology*, *11*(3), 61–69. https://files.eric.ed.gov/fulltext/EJ989199.pdf

Mustafa, S. H., & Al-Zoua'bi, L. F. (2008). *Usability of the academic Websites of Jordan's universities: An evaluation study* [Paper presentation]. The 9th International Arab Conference for Information Technology, Tunisia.

Permatasari, H. P., Harlena S., Erlangga D., & Chandra R. (2013). Effect of social media on Website popularity: Differences between public and private universities in Indonesia. *World of Computer Science and Information Technology Journal*, *3*(2), 32–37. http://www.wcsit.org/media/pub/2013/vol.3.no.2/Effect%20of%20Social%20Media%20on%20Website%20Popularity.pdf

Raduica, F., Enache, C., & Simion, I. (2019). Effective ways of managing Websites for academic institutions. *PEOPLE: International Journal of Social Sciences*, *5*(3), 206–214, https://doi.org/10.20319/pijss.2019.53.206214

Roy, S., Pattnaik, P. K., & Mall, R. (2014). A quantitative approach to evaluate usability of academic Websites based on human perception. *Egyptian Informatics Journal*, *15*, 159–167. http://dx.doi.org/10.1016/j.eij.2014.08.002

Sahusilawane, W., & Hiariey, L. S. (2016). The role of service quality toward open university Website on the level of student satisfaction. *Journal of Education and Learning*, *10*(2), 85–92. http://dx.doi.org/10.11591/edulearn.v10i2.3238

Undu, A., & Akuma, S. (2018). Investigating the usability of a university Website from the users' perspective: An empirical study of Benue State University Website. *International Journal of Computer and Information Engineering*, *12*(10), 922–929. https://doi.org/10.5281/zenodo.1474956

Uttarakhand Open University (2021). Accessed on July 14, 2020, www.uou.ac.in/index.php

Appendix A

Key e-Services Awareness Indicators

A1 Know the name of your university Website.

A2 Aware of online admissions link available on the Website.

A3 Know how to find the valid study centres listed on the university Website.

A4 Aware of notices or announcements published on university Website.

A5 Aware of Student One View link available on the Website.

A6 Aware of university recognition letters link available on the Website.

A7 Aware of online examination/back form application link available on the Website.

A8 Aware of the e-learning portal link available on the Website.

A9 Aware of video lectures' link available on the Website.

A10 Aware of downloading e-SILM link from the Website.

A11 Aware of downloading old question papers link on the Website.

A12 Aware of view/download results link available on the Website.

A13 Aware of the complaints/queries/grievances link available on the Website.

A14 Aware of downloading mobile application link available on the Website.

A15 Aware of frequently asked questions (FAQs) available on the Website.

Appendix B

Key e-Services Satisfaction Indicators

Q1 Online admissions.

Q2 View/download university prospectus.

Q3 Notices/announcements.

Q4 Important dates.

Q5 Online examination form/back form application.

Q6 e-Learning portal of the university.

Q7 Video lectures of the university.

Q8 Download e-SILM (PDF files).

Q9 Download old question papers.

Q10 View/download evaluation results.

Q11 Complaints/queries/grievances.

Q12 Mobile application of the university.

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Micro:bit Robotics Course: Infusing Logical Reasoning and Problem-Solving Ability in Fifth Grade Students Through an Online Group Study System

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Abstract

With rising societal interest in the subject areas of science, technology, engineering, art and mathematics (STEAM), a micro:bit robotics course with an online group study (OGS) system was designed to foster student learning anytime and anywhere. OGS enables the development of a learning environment that combines real-world and digital-world resources, and can enhance the effectiveness of learning among students from a remote area. In this pre- and post-test experiment design, we studied 22 (8 males and 14 females) 5th grade students from a remote area of Taiwan. A *t* test performed before and after the robotics course showed a positive increase in students' proportional reasoning, probabilistic reasoning, and ability to analyze a problem. Results also revealed a gender difference in the association between students' logical reasoning and problem-solving ability.

Keywords: logical reasoning, problem solving, micro:bit robot, gender differences, STEAM

Introduction

The importance of science, technology, engineering, art and mathematics (STEAM) education has been recognized worldwide, as has been the prevalence of online courses and their impact on improving students' logical thinking and problem-solving ability in a digitally-driven information society. Meanwhile, the advancement of science and technology as well as the development of robots have rapidly progressed in recent years. Robotic technologies such as autonomous vehicles, storage robots, and hotel automation operations have gradually infiltrated our everyday lives. New tools and online courses are necessary for the growing needs of developing competencies and skills in the 21st century (Voogt et al., 2013).

The British Broadcasting Corporation (BBC) collaborated with 29 companies and institutions (e.g., Microsoft, Advanced RISC Machine Ltd., Python Software Foundation) to develop an open source, handheld, and programmable embedded system microcomputer. Based on Acorn RISC Machine technology, and called micro:bit, it was designed to help students learn programing and robotics (Micro:bit, n.d.). Research conducted by Sentance et al. (2017) showed that micro:bit was easy for children to use and learn about STEAM. Researchers from King's College London (BBC) found that "90% agree that BBC micro:bit helped to show them that anyone can code" (2017, para. 2).

Programming logic has long been recognized as a tool essential for any business. Thus, teaching students how to code with robots is crucial; it requires that students experience several thinking processes and be introduced to interdisciplinary STEAM learning (Khine, 2017). To achieve this goal, a micro:bit online course helps students build skills in logic and systems thinking, while also engaging them in community discussions and online real-time functions to find better solutions. Moreover, a micro:bit robotics course helps students with self-directed learning through social cues and communication skills in online group discussions (Huang & Wu, 2011). Considering these advantages, this study used the micro:bit in a leading role. This study expected that children would learn and improve their logical reasoning ability from the micro:bit robotics course, which in turn would increase their opportunities to encounter difficulties and problems in everyday life. During daily school learning, the micro:bit robotics course served as an opportunity for students to test their problem-solving abilities.

Logical thinking is a process of transforming abstract emotional ideas into concrete rational concepts, and then using these concepts to judge, make conclusions according to certain logical relationships, and generate new understanding. Logical reasoning ability refers to a psychological process whereby information is converted from the unknown to the known. Logical reasoning ability is an important indicator of cognitive development and intelligence (Siegler, 1991), and is related to complex high-level thinking such as problem solving, social judgment, and criticism (Wright & Dowker, 2002). Roberge and Craven (1982) found that logical reasoning was closely related to mathematics, science, and language ability. Thus, logical reasoning ability can be improved through continuous learning. Although logical reasoning ability is a necessary element in argumentation and a key ability in adapting to future social changes, previous research has found limited evidence of a link between the ability to make logical connections and problem solving (Kuhn, 1991).

Yenilmez et al. (2005) investigated 7th to 12th grade students' logical-thinking ability and the effects of gender and grade level. After reviewing previous research, they found significant differences in gender and grade level between girls and boys. In addition, although a few studies have examined whether the effect of online courses is associated with the development of logical reasoning at the elementary school level (Liu et al., 2015), less knowledge is available with respect to the impact of online courses on the development of logical reasoning in rural areas and/or differences by gender. This study aimed to fill the gap by investigating the effect of the micro:bit robotics course on logical reasoning and problem-solving ability, and whether the effect varied between female and male students in a remote area of Taiwan. The remainder of this paper is organized as follows. First, we present a literature review, then we discuss the experimental design and results. Finally, we present our conclusions and discussion.

Literature Review

Test of Logical Thinking (TOLT)

Piaget and his colleagues conducted research and extensive analysis on the formal reasoning ability of teenagers and adults (Arlin, 1975; Chiappetta, 1976; Farrell, 1969; Lovello, 1961). The items defined in previous research determined the basis of Test of Logical Thinking (TOLT) (Lawson, 1978; Lawson et al., 1979). The TOLT has provided a reliable method to evaluate formal reasoning ability but has also aimed to construct a research tool that can be used for teaching and learning. This method included five valid items from previous studies, namely (a) controlling variables, (b) proportional reasoning, (c) combinatorial reasoning, (d) probabilistic reasoning, and (e) correlational reasoning. These five items have been considered as basic abilities in evaluating mathematics and science courses (Bitner, 1991).

According to Tobin and Capie (1984), evidence showed that TOLT had a high degree of internal consistency, and the validity data was sufficiently diverse to support a group test of formal thinking. In short, TOLT provided a method to precisely measure formal thinking. Furthermore, the resulting data was a useful reference for teachers to examine students' learning effectiveness.

Online Group Study (OGS)

Since the rapid development of network technology, online learning has received a great deal of attention (Lin et al., 2011; Lin et al, 2010); students' online reading behavior has become a subject of theory as well as application for researchers (Liu, 2005; O'Hara & Sellen, 1997). The OGS system, an online reading environment incorporating group study, was designed to provide students with opportunities to read and talk (Yu et al., 2012). Researchers have agreed that reading behaviors differ between digital and print texts (Birkerts, 1994; Bolter & Grusin, 2000).

With the OGS system, students can immediately share their experience of reading e-books with other students within the group. Students can use an online social network for exchanging information with other students (Huang et al., 2013). Additionally, teachers can provide guidance before students read, or during the reading process, within the same online social network. Through reading and discussions within the

group, students can share their knowledge, absorb the knowledge of others, improve their reading skills, and achieve meaningful learning experiences (Huang et al., 2011). The purpose of this study was threefold: (a) use the OGS system to facilitate teacher and student reading during group study with the micro:bit robotics course; (b) explore the interrelationships between students' logical reasoning ability and their problem-solving ability after their involvement in the micro:bit robotics course with OGS; and (c) obtain and analyze student feedback after use of the OGS system using the Test of Logical Thinking (TOLT) to measure five models of formal reasoning.

Problem Solving

Problem solving and logical reasoning are two key types of thinking. Thinking, in terms of formal, logical reasoning normally begins to appear at about developmental age 11 or 12 (Flavell, 2007). Axten et al. (1973) proposed a description for the term "problem" when they stated that "to describe continuously his efforts to solve it" (p. 170). After the problem arises, an individual will typically try to solve it, which indicates problem solving in action (Bransford & Stein, 1984). Gagné (1985) proposed that problem solving be seen as a process in which learners find they can combine previously learned rules (e.g., concepts, plans) and apply them to solve a current problem for which they have no direct precedent. Therefore, problem solving is the ability to use old experiences and prior knowledge to detect problems, collect and think about relevant information, develop new methods through inquiry and reasoning, and obtain the answer at the end of the process.

John Dewey, in his book *How We Think,* pointed out that through daily problems or situations, people are forced to think about solutions during the process of learning, which is the process of problem solving (Dewey, 1910). Dewey's problem-solving steps are (a) define the problem, (b) analyze the problem, (c) propose solutions, (d) evaluate the proposed solutions, and (e) select one solution.

In the micro:bit robotics course, students learned logical reasoning; during the process of programming, they encountered difficulties and problems. Therefore, this course also presented an opportunity to test their problem-solving abilities.

Gender Differences

Sungur and Tekkaya (2003) explored the influence of gender and reasoning ability on students' learning achievements and attitudes. According to their results, there was no interaction between gender difference and reasoning ability. Valanides (1996) conducted research with 7th to 9th graders to investigate gender and grade-level differences in five formal reasoning modes from TOLT. Results showed no gender differences. Though students in the higher grades performed better in the proportional reasoning aspect of TOLT. In other research conducted by Valanides (1997) on potential gender differences among 12th graders, results showed that the participants performed better on proportional reasoning and controlling variables. Yenilmez et al. (2005) noted that male students tended to perform better on probabilistic reasoning than did female students. However, in terms of learning achievement, the results were the opposite.

Despite the dearth of research on logical reasoning and gender differences in recent years, the issue of gender differences still exists in STEAM, problem solving, and programing areas. For example,

Hacıömeroğlu and Hacıömeroğlu (2017) examined the relationships among gender, spatial ability, logical reasoning ability, and preferred mode of processing; they found no significant differences between the two genders in mode preference and logical reasoning ability. Conradty and Bogner (2018) explored students' creative ability when science, technology, engineering, and math (STEM) was enhanced to become STEAM; gender differences in studies on creativity remain ambiguous. Yurdugül and Aşkar (2013) investigated the differences between gender and general problem-solving skills in development of programming knowledge, but there were no significant gender differences in programming achievement.

Although research on gender differences in logical reasoning has been inconclusive, Jung (2012) found that even though distance education has contributed to widening access to education and reducing the gender disparity in education, there remains a lack of gender-based considerations in Asian distance education. This study assumed the presence of a gender difference in the association between logical reasoning and problem solving, revealed by a possible subgroup variation in relation to the effect of the micro:bit robotics course with OGS.

Method

Participants

The experimental pre- and post-test design aimed to explore the effect of the micro:bit robotics course with OGS on students' logical reasoning and problem-solving ability, and whether this effect varied between male and female students. A total of 22 students in an elementary school in southern Taiwan (8 males and 14 females, with a mean age of 10.6 years) participated in the study. Students had been in contact with computers since the third grade of elementary school. Each student was able to conduct a basic Internet search, do word processing, and demonstrate basic logic programming skills such as Scratch and those developed at code.org.

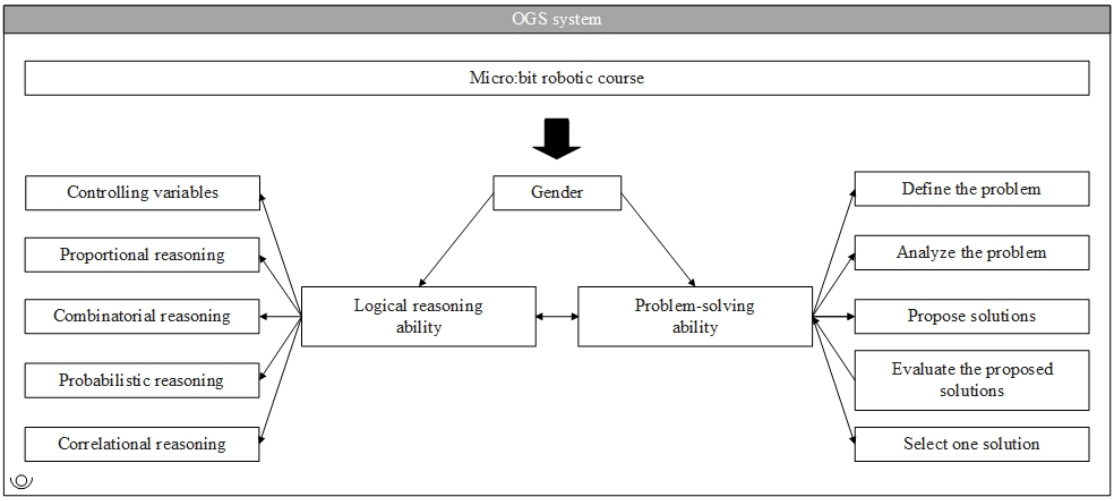
Since the school was in a remote area of Taiwan, this study used the OGS system to teach the micro:bit robotics course, as OGS provided a real-time group study platform and online social network functions. Teachers and students uploaded learning materials to the OGS system, including e-books, slides, videos, animations, and MS-Word documents. Teachers and students joined an online group study, simultaneously studying the learning materials, coding samples, and demonstrations.

Data Collection and Analysis

This study divided the pre-test and post-test measurements into two parts—the logical reasoning ability test and the problem-solving ability test. The detailed experimental framework is shown in Figure 1. The experiment ran for three months, from August 2019 to November 2019. Each class met once per week for 40 minutes each time. After collecting the pre-test and post-test data from TOLT and the problem-solving test, a significance level was set ($a = .05$); we used SPSS (version 22) for two-tail analysis to understand the interrelationships between students' logical reasoning and problem-solving ability after learning with the micro:bit robotics course with OGS.

Figure 1

Experimental Framework



Instruments and Activities

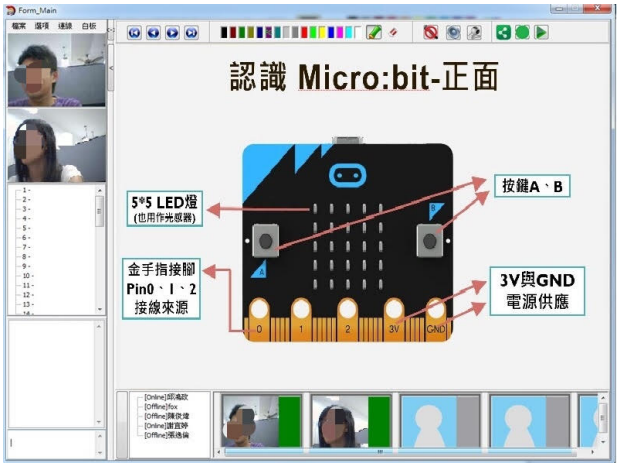
Teachers for the experimental class agreed to use online group study to support their provision of lectures during the semester. The learning materials were uploaded to the online social network for students. The procedure used for the group study was as follows.

Before Group Study

The students were divided into groups. Each group includes at least 2 students In accordance with the course content, the teacher provided e-books and related learning materials about the micro:bit robotics course as shown in Figure 2. A group leader was responsible for the work, including convening the group, discussion, knowledge sharing, and implementation.

Figure 2

Student Activity Before Group Study



During Group Study

During the warm-up activities, the teacher used robot-related news or videos to stimulate students' learning interest based on the e-book's course goals. During the activities, the teacher explained the logical reasoning behind the program code and demonstrated how to work with the micro:bit robot, as shown in Figure 3. During the practice activities, the teacher encouraged students to try coding themselves. If students encountered problems, they were supported in trying to solve the problem. During the activities, the teacher stimulated students' creative thinking through having them write more functional programs and demonstrate the operation of their own robots to other groups on the OGS.

Figure 3

Student Activity During Group Study

After Group Study

The teacher and students shared their experiences about how to solve the problem or modify the code to make the robot work through the online group study system, as shown in Figure 4.

Figure 4

Student Activity After Group Study

Hypothesis and Questionnaires

This study investigated elementary students' logical reasoning ability, problem-solving ability, and gender differences. The following questions guided the study:

1. Did 5th grade students increase their logical reasoning ability after attending the micro:bit robotics course?

2. Did 5th grade students increase their problem-solving ability after attending the micro:bit robotics course?

3. Did the improvement in students' logical reasoning ability after they attended the micro:bit robotics course differ between male and female students?

4. Did the improvement in students' problem-solving ability after they attended the micro:bit robotics course differ between male and female students?

5. Was there a gender difference in the students' performance in logical reasoning ability and problem-solving ability?

Based on the Test of Logical Thinking developed by Tobin and Capie (1984), the logical reasoning questionnaire used in this study aimed to determine students' formal reasoning skills. There were 30 items in the questionnaire to measure controlling variables (items 1 to 6), proportional (items 7 to 12),

combinatorial (items 13 to 18), probabilistic (items 19 to 24), and correlational (items 25 to 30) reasoning. Each correct item received 1 point, but wrong and blank answers were given 0 points, for a total of 30 points. The range of test scores was 0 to 30. The developers have demonstrated the psychological characteristics of TOLT. The questionnaire was translated into Chinese with a reliability of 0.76. The pre-test and post-test instruments had the same structure but different content; all characters were text and there were no graphical problems.

The problem-solving ability questionnaire had 10 items that focused on two major questions. Each major question was divided into Dewey's five-step problem-solving process: (a) define the problem (items 1 and 6); (b) analyze the problem (items 2 and 7); (c) propose solutions (items 3 and 8); (d) evaluate the proposed solutions (items 4 and 9); and (e) select one solution (items 5 and 10). Each question was worth 1 point, awarded for the correctness of the answer. Questions 2 and 5 had only one correct answer; questions 1, 3, and 4 had multiple potential answers. There was no upper limit on the overall score; the higher the score, the better the problem-solving ability.

Results

To investigate the effect of a micro:bit course on students' logical reasoning and problem-solving ability, a dependent sample of paired *t* tests between pre- and post-test was performed. Given the small sample in this study, we also reported the non-parametric of the Wilcoxon signed rank test for the dependent samples *t* test. In our case, we have an ordinal repeated outcome in the pre-test and post-test with a small sample size (N = 22), which did not fit the assumption of the normal distribution in the outcome. We adopted a common alternative to test the difference when its assumptions were not met.

The results of the students' logical reasoning ability between pre-test and post-test are shown in Table 1. Students' logical reasoning consisted of five measures: (a) controlling variables, (b) proportional reasoning, (c) combinatorial reasoning, (d) probabilistic reasoning, and (e) correlational reasoning. Post-test scores of all five measures were higher than pre-test scores. Among the five measures, the post-test scores of proportional reasoning ($T_{paired\ t-test}$ = 3.167, p = .005) and probabilistic reasoning ($T_{paired\ t-test}$ = 4.743, p = .000) were significantly higher than the pre-test scores. The results of the two-tailed Wilcoxon signed rank test were also significant for proportional reasoning (z = 2.543, p < .05) and probabilistic reasoning (z = 3.476, p < .01). The results indicated that the median of proportional reasoning post-test was significantly higher than the median in the proportional reasoning pre-test. Likewise, the median of probabilistic reasoning post-test was significantly higher than the median in the probabilistic reasoning pre-test. Effect size is reported in column eight of Table 1. Cohen's *d* of proportional reasoning was .79 and Cohen's *d* of the probabilistic reasoning was 1.32. In the total score for the five measures, the results indicated that the difference between pre-test and post-test scores was statistically significant ($T_{paired\ t-test}$ = 3.594, p = .002) and the two-tailed Wilcoxon signed rank test (z = 2.801, p<.01). Cohen's *d* of the total score was .80. With respect to the standard deviation, five measures of logical reasoning in the post-tests were larger than those in the pre-test, indicating that after the implementation of the micro:bit robot course, the differences in the

scores of each aspect became larger. In short, the micro:bit robot course improved the students' ability in proportional reasoning, probabilistic reasoning, and the total scores of logical reasoning.

Table 1

Mean Difference of Logical Reasoning Ability for the Micro:bit Robotics Course in the Pre-Test and Post-Test

Logical Reasoning ability	Pre-Test		Post-Test		Diff.		*p*-value	Wilcoxon rank test [b]		ES [a]
	Mean	*SD*	Mean	*SD*						
Controlling variables	3.45	0.67	3.73	0.55	0.27		0.56	1.897		
Proportional reasoning	2.55	0.74	3.27	0.98	0.73	*	.005	2.543	*	.79
Combinatorial reasoning	5.95	1.53	6.32	2.23	0.36		.474	.964		
Probabilistic reasoning	1.55	0.86	3.00	1.20	1.45	***	.000	3.476	**	1.32
Correlational reasoning	2.45	0.80	3.23	1.80	0.77		.121	1.486		
Total scores (0–30)	15.95	2.36	19.55	5.28	3.59	**	.002	2.801	**	.80

Note. Total sample $N = 22$.

*** p < .001, ** p < .01, * p < .05, two-tailed paired *t* test.

[a.] Cohen's *d* was reported to measure the effect size. Cohen (1988) defined the magnitude of the effect as small ($d = 0.2$), medium ($d = 0.5$), or large ($d = 0.8$).

[b.] The Wilcoxon signed rank test was reported to confirm the results of the dependent samples *t* test when the assumption of normality did not fit.

The results for problem-solving ability between the pre-test and post-test are shown in Table 2. Students' problem-solving ability consisted of five measures: (a) define the problem, (b) analyze the problem, (c) propose solutions, (d) evaluate the proposed solutions, and (e) select one solution. Post-test scores of all five measures were higher than pre-test scores. Among the five measures, only the post-test of "analyze the problem" ($T_{paired\ t-test} = 2.614$, $p = .016$) was significantly higher than the pre-test. We applied the two-tailed Wilcoxon signed rank test and also found a similar significance for "analyze the problem" and the total scores for problem solving. In addition to each measure of problem solving, the total scores for problem solving also showed that the post-test was significantly higher than the pretest scores ($T_{paired\ t-test} = 2.184$, $p = .040$). With respect to the standard deviation, five measures of problem-solving ability in the post-test were larger than those in the pre-test, indicating that after the implementation of the micro:bit

robotics course, the differences in the scores for each aspect became larger. In short, the micro:bit robotics course improved students' ability to analyze the problem, as well as problem-solving ability as a total score.

Table 2

Mean Difference of Problem-Solving Ability for the Micro:bit Robotics Course in the Pre-Test and Post-Test

Problem-solving ability	Pre-Test		Post-Test		Diff.		P-value	Wilcoxon rank test [b]		ES [a]
	Mean	SD	Mean	SD						
Define the problem	3.41	1.79	4.09	1.74	0.68		.061	.359		
Analyze the problem	1.00	0.82	1.41	0.80	0.41	*	.016	.038	*	0.5
Propose a solution	1.55	1.44	1.91	1.72	0.36		.401	.804		
Evaluate the proposed solutions	2.82	1.05	3.27	2.29	0.45		.381	1.000		
Select one solution	2.23	0.75	2.68	1.52	0.45		.125	.238		
Total assessment score	11.00	4.38	13.36	6.59	2.36	*	.040	.189	*	0.39

Note. Total sample $N = 22$.

* $p < .05$, two-tailed paired t test.

[a.] Cohen's d was reported to measure the effect size.

[b.] The Wilcoxon signed rank test was reported to confirm the results of the dependent samples t test when the assumption of normality did not fit.

Taking gender as the self-variant, the changed scores for logical reasoning ability from pre-test to post-testwas the dependent variable; analysis of the independent two sample t test explored the gender differences in logical reasoning ability as shown in Table 3. Before analyzing the gender differences in changes between pre-test and post-test, we investigated the homogeneity hypothesis in the variance of the male and female sample across all measures of logical reasoning. The Levene test value of the variance was found to be an insignificant indication of the unequal variance between the male and female sample across all measures. Therefore, we can assume there was equal variance between male and female students across all measures of the logical reasoning ability.

Table 3

Gender Differences in Logical Reasoning Ability After Completing the Micro:bit Robotics Course

Panel A: Pre-Test	Male (n = 8)				Female (n = 14)					ΔMale-Female
	Pre-Test		Post-Test		Pre-Test		Post-Test			*t* Test
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*		
Controlling variables	3.50	0.76	3.61	0.52	3.43	0.65	3.79	0.58		-0.72
Proportional reasoning	2.25	0.71	3.00	0.76	2.71	0.73	3.43	1.09		-0.98
Combinatorial reasoning	5.75	1.91	5.13	2.03	6.07	1.33	7.00	0.56	**	-3.28
Probabilistic reasoning	1.75	1.16	2.75	1.16	1.43	0.65	3.14	1.23		-0.73
Correlational reasoning	2.25	0.89	2.75	1.98	2.57	0.76	3.50	1.70		-0.93
Total assessment score (0–30)	15.50	3.21	17.25	5.12	16.21	1.81	20.86	5.08		-1.59

** p < .01, two-tailed *t* tests.

Female students reported a lower level of controlling variables and probabilistic reasoning in the pre-test, but their gains from pre-test to post-test score were higher than were male students' in the level of controlling variables and probabilistic reasoning. From the pre-test to post-test, female students improved by 0.36 points for the controlling variables and 1.71 points for probabilistic reasoning, indicating that the female students' progress on the level of controlling variables and probabilistic reasoning was greater than was the male students. To further confirm whether the progress (changed scores) differed between male and female students, we employed the two-sample *t* test. The results showed that the differences did not reach statistical significance.

Female students reported a higher level of proportional reasoning, combinatorial reasoning, and correlational reasoning in both the pre-test and post-test. We ran the two-sample *t* test to examine whether the changed scores differed between male and female students. The results showed that there was a significant gender difference in the changed scores for combinatorial reasoning. However, we did not find the same significance in the two-tailed Wilcoxon signed rank test. This may indicate the gender difference in the combinatorial reasoning was due to the small sample.

The results of the two independent sample *t* tests on the changed scores for problem-solving ability are shown in Table 4. We first checked the Levene test value of the variance and found that there was no significant indication of unequal variance between the male and female sample across all measures of problem-solving ability. Therefore, we can assume there was equal variance between male and female students across all measures of problem-solving ability. We ran the two-sample *t* test to examine whether the changed scores differed between male and female students. The results showed that there was a

significant gender difference in the changed scores for selecting one solution, and this gender difference was confirmed in the two-tailed Wilcoxon signed rank test ($z = 2.561$, $p < .05$).

Table 4

Gender Differences in Problem-Solving Ability After Completing the Micro:bit Robotics Course

Problem-solving ability	Male				Female					ΔMale-Female
	Pre-Test		Post-Test		Pre-Test		Post-Test			*t* Test
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*		
Define the problem	2.38	1.60	3.63	2.00	4.00	1.66	4.36	1.60		1.265
Analyze the problem	0.88	0.83	1.13	0.99	1.07	0.83	1.57	0.65		-0.761
Propose solution	1.00	1.07	1.25	1.28	1.86	1.56	2.29	1.86		-0.198
Evaluate the proposed solutions	2.50	0.93	2.75	2.87	3.00	1.11	3.57	1.95		-0.297
Select one solution	2.00	0.76	1.63	1.85	2.36	0.74	3.29	0.91	*	-2.451
Total assessment score	8.75	3.37	10.38	8.05	12.29	4.46	15.07	5.17		-0.507

* $p < .05$, two-tailed *t* tests.

To further examine whether male students had significantly higher correlation between logistical reasoning and problem solving than did female students, we used the Fisher r-to-z transformation to assess the significance of the difference between two correlation coefficients in two independent samples (Preacher, 2002; http://quantpsy.org/corrtest/corrtest.htm). Our results in Table 5 show that male students ($r = .926$) had significantly higher correlation between logistic reasoning and problem solving than did females ($r = .501$) in the post-test ($z = 2.00$, $p = .045$). The effect size for the difference between two correlations was 1.079.

Table 5

Correlation Between Logistic Reasoning Ability and Problem-Solving Ability

Population	Variable	1		2		3		4
Male	1. Logistic reasoning pre-test	1						
	2. Logistic reasoning post-test	.278		1				
	3. Problem solving pre-test	.436		.749	*	1		
	4. Problem solving post-test	.329		**.926**	***	.830	*	1
Female	1. Logistic reasoning pre-test	1						
	2. Logistic reasoning post-test	.633	*	1				
	3. Problem solving pre-test	.737	**	.701	**	1		
	4. Problem solving post-test	.625	*	**.501**		.483		1

Note. Full sample $N = 22$, male sample $n = 8$, female sample $n = 14$.
*** $p < .001$. ** $p < .01$. * $p < .05$.

According to Tables 1 to 5, we have made the following conclusions about our hypotheses:

1. Attending students had higher post-test scores on the logical reasoning test, indicating that the micro:bit robot course increased the students' logical reasoning ability.

2. Attending students had higher post-test scores on the problem solving test, indicating that the micro:bit robot course increased the students' problem-solving ability.

3. There were equal variances between male and female students across all measures of logical reasoning ability; we did not find strong evidence of gender difference in the changed scores for combinatorial reasoning.

4. There was no gender difference between the mean scores of male and female students in problem-solving abilities related to the five problem-solving steps, but there was a significant gender difference in the changed scores for selecting one solution.

5. Male students had a significantly positive correlation between logistical reasoning and problem solving on the post-test. We found no evidence of a positive correlation between logistical reasoning and problem solving on female students' post-tests.

Conclusions and Discussion

People mistakenly assume that the ultimate goal of science and technology courses is to force children to grow and prepare to be scientists, mathematicians, and engineers (Sullivan, Strawhacker, &Bers, 2017). In contrast, STEAM education aims to provide children with systematic themes and experiences suitable for them during their school years and beyond (Bers, 2012). From this point of view, the results of this study reported the effect of a micro:bit robotics course with OGS on logical reasoning ability and problem-solving ability, as well as gender differences among fifth graders. There are two perspectives from which one can assess the value of these results.

From the first perspective, knowing students' weaknesses in logical reasoning and problem-solving skills is critical in order for teachers to predict students' difficulties and then modify their teaching strategies to make concepts easier to understand. In this study, the micro:bit robotics course with OGS greatly improved participants' logical reasoning ability. Results indicate that the robotics course was helpful for students. Throughout the course, students encountered many difficulties, such as the robot not being able to move as expected due to incorrect programming, hardware problems, or human factors. Even so, students were encouraged to find and solve problems by redesigning programming strategies or changing hardware, thereby facilitating the development of their problem-solving abilities. Teachers can also evaluate students' logical reasoning problems by understanding the reasoning skills that students currently adopt and using these as a reference to modify teaching strategies.

Moreover, comparing the logical reasoning performance of male and female students, there were equal variances across all measures of logical reasoning ability, but there were gender differences on the changed scores for combinatorial reasoning when we applied the paired *t* test. However, we did not find similar gender difference when we applied the two-tailed Wilcoxon signed rank test. This result indicates the gender difference in combinatorial reasoning is due to the small sample and violation of the normality assumption. Furthermore, when comparing the problem-solving performance of male and female students, there was no gender difference between male and females, but there a significant gender difference in the changed scores for selecting one solution. Thus, despite no differences between males and females, we can see that logical reasoning may influence the problem-solving methods of males and females. Meanwhile, male students had a significantly positive correlation between logistical reasoning and problem solving on the post-test. It appears that gender differences still play a role in students' logistical reasoning and problem-solving abilities.

Gender differences in terms of social interaction styles occur in the traditional classroom, such as the notion that boys are more likely than girls to participate in class discussion. As with physical differences, however, gendered social differences may not occur uniformly for all boys and girls. The performance of boys and girls between traditional classrooms and online courses may be very different. From an equity-in-learning perspective, the future goal of this study is to expand with a larger sample size and design more effective intervention strategies based on gender differences, and thereby explore social differences between boys and girls in online courses.

Our effect size ranged from moderate to large, which is unusual. Although the effect sizes seem to be large, this is probably due to our small sample size. We need to be cautious when interpreting effect size and reporting this as our final discovery. In future, we may be able to provide more effective evidence if we have larger sample.

While the results of this study are promising, we used a small sample and therefore results should not be interpreted as a general randomization pre- and post-test design for the 5th grade student population. This is our first step in developing a field test of the micro:bit robotics course with OGS as an approach that may improve students' logical thinking and problem-solving ability. Our vision is to incorporate the micro:bit robotics course as part of a strategy of having coding teacher specialists operating in low-income schools in rural areas where STEAM resources are limited. We argue that these types of online learning experiences can be particularly useful and effective as a support tool for elementary students' lack of family and school resources about STEAM.

Due to the prevalence of the COVID-19, except for Taiwan and a few countries that are still keeping schools open, almost all countries in the world have closed their educational institutions. For millions of learners, learning has been forcibly interrupted (United Nations Educational Scientific and Cultural Organization [UNESCO], n.d.). In order to minimize the impact of interrupted education and integrate continuous learning, teachers should provide multiple learning environments or backup plans for teaching to improve their teaching in order to meet rapidly changing needs. At the same time, the application of distance education has become a very hot topic and has received considerable attention.

Deeper and wider implementation of distance education needs to be considered. In order to make distance education more meaningful, teachers need to help students choose learning content and attend to their learning progress. Meanwhile, based on the theory proposed by Remmele and Holthaus (2013), the more widespread the use of digital learning, the less gender differences occur among students. Distance education will need to be developed as an open and flexible form of instruction that can be adjusted to address students' requirements (Peters, 2000). Teachers who can follow these guidelines and be aware of these differences can then design appropriate e-learning lessons. Moreover, with continued research and reflection, distance education will become a new self-learning and student-oriented tool for a new generation.

References

Arlin, P. K. (1975). Cognitive development in adulthood: A fifth stage? *Developmental Psychology*, *11*(5), 602–606. https://doi.org/10.1037/0012-1649.11.5.602

Axten, N., Newell, A., & Simon, H. A. (1973). Human problem solving. *Contemporary sociology* , 2(2), 169-170. https://doi.org/10.2307/2063712

Bers, M. U. (2012). *Designing digital experiences for positive youth development: From playpen to playground*. Oxford University Press. https://doi.org/10.1093/acprof:oso/9780199757022.001.0001

Birkerts., S. (1994). *The Gutenberg elegies: The fate of reading in an electronic age*. Faber and Faber.

Bitner, B. L. (1991). Formal operational reasoning modes: Predictors of critical thinking abilities and grades assigned by teachers in science and mathematics for students in grades nine through twelve. *Journal of Research in Science Teaching*, *28*(3), 265–274. https://doi.org/10.1002/tea.3660280307

Bolter, J., & Grusin, R. (2000). *Remediation: Understanding new media*. The MIT Press.

Bransford, J., & Stein, B. S. (1984). *The ideal problem solver: A guide for improving thinking, learning, and creativity*. Freeman.

British Broadcasting Corporation. (2017, July 7). *BBC micro:bit celebrates huge impact in first year, with 90% of students saying it helped show that anyone can code.* https://www.bbc.co.uk/mediacentre/latestnews/2017/microbit-first-year

Chiappetta, E. L. (1976). A review of Piagetian studies relevant to science instruction at the secondary and college level. *Science Education*, *60*(2), 253–261. https://doi.org/10.1002/sce.3730600215

Cohen, J.. (1988). Statistical power analysis for the behavioral sciences. New York, NY: Routledge Academic [Google Scholar] http://www.utstat.toronto.edu/~brunner/oldclass/378f16/readings/CohenPower.pdf

Conradty, C., & Bogner, F. X. (2018). From STEM to STEAM: How to monitor creativity. *Creativity Research Journal*, *30*(3), 233–240. https://doi.org/10.1080/10400419.2018.1488195

Dewey, J. (1910). *How we think*. D. C. Heath. https://doi.org/10.1037/10903-000

Farrell, M. A. (1969). The formal stage: A review of the research. *Journal of Research and Development in Education*, *3*, 111–118.

Flavell, J. H. (2007). *The developmental psychology of Jean Piaget*. D. Van Nostrand Company. https://doi.org/10.1037/11449-000

Gagné, R. M. (1985). *The conditions of learning and theory of instruction*. Holt, Rinehart and Winston.

Hacıömeroğlu, G., & Hacıömeroğlu, E. S. (2017). Examining the relationship between gender, spatial ability, logical reasoning ability, and preferred mode of processing. *Adıyaman Üniversitesi Eğitim Bilimleri Dergisi*, *7*(1), 116–131. https://doi.org/10.17984/adyuebd.310833

Huang, Y. M., Chiu, P. S., Liu, T. C., & Chen, T. S. (2011). The design and implementation of a meaningful learning-based evaluation method for ubiquitous learning. *Computers and Education*, *57*(4), 2291–2302. https://doi.org/10.1016/j.compedu.2011.05.023

Huang, Y. M., Huang, Y. M., Liu, C. H., & Tsai, C. C. (2013). Applying social tagging to manage cognitive load in a Web 2.0 self-learning environment. *Interactive Learning Environments*, *21*(3), 273–289. https://doi.org/10.1080/10494820.2011.555839

Huang, Y. M., & Wu, T. T. (2011). A systematic approach for learner group composition utilizing u-learning portfolio. *Educational Technology and Society*, *14*(3), 102–117. https://doi.org/10.1049/cp.2010.0563

Jung, I. (2012). Asian learners' perception of quality in distance education and gender differences. *The International Review of Research in Open and Distributed Learning*, *13*(2), 1–25. https://doi.org/10.19173/irrodl.v13i2.1159

Khine, M. S. (2017). *Robotics in STEM education: Redesigning the learning experience*. Springer. https://doi.org/10.1007/978-3-319-57786-9

Kuhn, D. (1991). *The skills of argument*. Cambridge University Press. https://doi.org/10.1017/cbo9780511571350

Lawson, A. E. (1978). The development and validation of a classroom test of formal reasoning. *Journal of Research in Science Teaching*, *15*(1), 11–24. https://doi.org/10.1002/tea.3660150103

Lawson, A. E., Adi, H., & Karplus, R. (1979). Development of correlational reasoning in secondary schools: Do biology courses make a difference? *The American Biology Teacher*, *41*(7), 420–430. https://doi.org/10.2307/4446678

Lin, Y.-C., Lin, Y.-T., & Huang, Y.-M. (2011). Development of a diagnostic system using a testing-based approach for strengthening student prior knowledge. *Computers & Education*, *57*, 1557–1570. https://doi.org/10.1016/j.compedu.2011.03.004

Lin, Y.-T., Huang, Y.-M., & Cheng, S.-C. (2010). An automatic group composition system for composing collaborative learning groups using enhanced particle swarm optimization. *Computers & Education*, *55*(4), 1483–1493. https://doi.org/https://doi.org/10.1016/j.compedu.2010.06.014

Liu, H., Ludu, M., & Holton, D. (2015). Can K–12 math teachers train students to make valid logical reasoning? In X. Ge, D. Ifenthaler, & J. Spector (Eds.) *Emerging technologies for STEAM education* (pp. 331–353). Springer. https://doi.org/10.1007/978-3-319-02573-5_18

Liu, Z. (2005). Reading behavior in the digital environment: Changes in reading behavior over the past ten years. *Journal of Documentation*, *61*(6), 700–712. https://doi.org/10.1108/00220410510632040

Lovell, K. (1961). A follow-up study of inhelder and Piaget's: The growth of logical thinking. *British Journal of Psychology*, *52*(2), 143–153. https://doi.org/10.1111/j.2044-8295.1961.tb00776.xMicro:bit. (n.d.). *Let's code*. https://microbit.org/code/

O'Hara, K., & Sellen, A. (1997, March). Comparison of reading paper and on-line documents. In *CHI '97: Proceedings of the ACM SIGCHI conference on human factors in computing systems* (pp. 335–342). https://doi.org/10.1145/258549.258787

Peters, O. (2000). Digital learning environments: New possibilities and opportunities. *The International Review of Research in Open and Distributed Learning*, *1*(1). https://doi.org/10.19173/irrodl.v1i1.3

Preacher, K. J. (2002, May). Calculation for the test of the difference between two independent correlation coefficients [Computer software]. Available from http://quantpsy.org.

Remmele, B., & Holthaus, M. (2013). De-gendering in the use of e-learning. *The International Review of Research in Open and Distributed Learning*, *14*(3), 27–42. https://doi.org/10.19173/irrodl.v14i3.1299

Roberge, J. J., & Craven, P. A. (1982). Developmental relationships between reading comprehension and deductive reasoning. *The Journal of General Psychology*, *107*(1), 99–105. https://doi.org/10.1080/00221309.1982.9709912

Sentance, S., Waite, J., Hodges, S., MacLeod, E., & Yeomans, L. (2017, March). "Creating cool stuff": Pupils' experience of the BBC micro:bit. In *SIGCSE '17: Proceedings of the 2017 ACM SIGCSE Technical Symposium on Computer Science Education* (pp. 531–536). https://doi.org/10.1145/3017680.3017749

Siegler, R. S. (1991). *Children's thinking* (2nd ed.). Prentice-Hall.

Sullivan, A., Strawhacker, A., & Bers, M. U. (2017). Dancing, drawing, and dramatic robots: Integrating robotics and the arts to teach foundational STEAM concepts to young children. In M. Khine (Ed.), *Robotics in STEM education: Redesigning the learning experience* (pp. 231–260). Springer. https://doi.org/10.1007/978-3-319-57786-9_10

Sungur, S., & Tekkaya, C. (2003). Students' achievement in human circulatory system unit: The effect of reasoning ability and gender. *Journal of Science Education and Technology*, *12*(1), 59–64. https://doi.org/10.1023/A:1022111728683

Tobin, K., & Capie, W. (1984). Application of the Test of Logical Thinking. *Journal of Science and Mathematics Education in Southeast Asia*, *7*(1), 5–9.

United Nations Educational Scientific and Cultural Organization. (n.d.). Education: From disruption to recovery. https://en.unesco.org/covid19/educationresponse

Valanides, N. C. (1996). Formal reasoning and science teaching. *School Science and Mathematics*, *96*(2), 99–107. https://doi.org/10.1111/j.1949-8594.1996.tb15818.x

Valanides, N. C. (1997). Cognitive abilities among twelfth-grade students: Implications for science teaching. *Educational Research and Evaluation*, *3*, 160–186. https://doi.org/10.1080/1380361970030204

Voogt, J., Erstad, O., Dede, C., & Mishra, P. (2013). Challenges to learning and schooling in the digital networked world of the 21st century. *Journal of Computer Assisted Learning*, *29*(5), 403–413. https://doi.org/10.1111/jcal.12029

Wright, B., & Dowker, A. (2002). The role of cues to differential absolute size in children's transitive inferences. *Journal of Experimental Child Psychology*, *81*, 249–275. https://doi.org/10.1006/jecp.2001.2653

Yenilmez, A., Sungur, S., & Tekkaya, C. (2005). Investigating students' logical thinking abilities: The effects of gender and grade level. *Hacettepe University Journal of Education*, *28*, 219–225.

Yu, P. T., Su, M. H., Cheng, P. J., & Liao, Y. H. (2012). Utilizing an online group study environment to enhance student reading ability and learning effectiveness. *Journal of Internet Technology*, *13*(6), 981–988. https://doi.org/10.6138/JIT.2012.13.6.12

Yurdugül, H., & Aşkar, P. (2013). Learning programming, problem solving and gender: A longitudinal study. *Procedia - Social and Behavioral Sciences*, *83*, 605–610. https://doi.org/10.1016/j.sbspro.2013.06.115

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Are Highly Motivated Learners More Likely to Complete a Computer Programming MOOC?

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Abstract

Computer programming MOOCs attract people who have different motivations. Previous studies have hypothesized that the motivation declared before starting the course can be an important predictor of distinctive dropout rates. The aim of this study was to outline the main motivation clusters of participants in a computer programming MOOC, and to compare how these clusters differed in terms of intention to complete and actual completion rate. The sample consisted of 1,181 respondents to the pre-course questionnaire in the *Introduction to Programming* MOOC. A validated motivation scale, based on expectancy-value theory and k-means cluster analysis, was used to form the groups. The four identified clusters were named as Opportunity motivated (27.7%), Over-motivated (28.6%), Success motivated (19.6%) and Interest motivated (24.0%). Comparison tests and chi-square test were used to describe the differences among the clusters. There were statistically significant differences among clusters in self-evaluated probability of completion. Also, significant differences emerged among three clusters in terms of percentages of respondents who completed the MOOC. Interestingly, the completion rate was the lowest in the Over-motivated cluster. A statistically significant higher ratio of completers to non-completers was found in the Opportunity motivated, Success motivated, and Interest motivated clusters. Our findings can be useful for MOOC instructors, as a better vision of participants' motivational profiles at the beginning of the MOOC might help to inform the MOOC design to better support different needs, potentially resulting in lower dropout rates.

Keywords: MOOC, motivation, programming, clusters, completion

Introduction

The interest in learning programming and computer science has been growing in recent years; nowadays society needs more and more people with programming skills. Massive open online courses (MOOCs) are a possible way to meet this demand and educate a large number of people. Despite their enormous popularity, MOOCs still have an extensive problem with dropout. One variable related to dropout is the motivation to start the course (Reparaz et al., 2020). Motivation to start the MOOC is different from motivation in traditional courses and is more diverse: some participants merely want to use the materials, others learners are highly motivated and follow every aspect of the course, while some simply enjoy interacting with other MOOC learners (Daza et al., 2013). It is important to understand how to make a MOOC work for as many of its diverse participants as possible (Grover et al., 2013).

Existing research on MOOCs has focused on classification of MOOC learners based on their behavior during the course (Feklistova et al., 2019; Kahan et al., 2017; Kizilcec et al., 2013; Tseng et al., 2016). However, different motivational goals may predict different behavioral patterns for MOOC learners and dropouts (Kizilcec & Schneider, 2015), and MOOC completers can be characterized according to their motivation to learn (Barak et al., 2016). Lately, it has been shown that the classification of MOOC participants according to their motivations and intentions at the beginning of the MOOC can help to identify in advance the benefits and potential obstacles that one can find throughout a MOOC (Maya-Jariego et al., 2019). Therefore, this research aimed to outline the main motivation clusters of participants in a computer programming MOOC and compare the differences in completion rates between these clusters.

Literature Review

Motivation

Motivation can be defined as an internal state or condition that activates behavior and gives it direction (Huitt, 2011). Motivation can be affected by several factors, such as self-efficacy and competence beliefs, control beliefs, interest, value beliefs, and achievement goals (Pintrich, 2003). Motivation to learn is one type of motivation that can be conceptualized as the degree to which students invest attention and effort in various learning activities (Brophy, 2013). Motivation plays a key role in learning and academic performance (Green et al., 2012) and has an important effect on student achievement (Orhan Özen, 2017). In general, explanations relating to the sources of motivation can be categorized into two main categories: intrinsic (internal to the person) and extrinsic (outside the person; Deci et al., 2001). Studies on why people choose a teaching career have also added altruistic motivation, namely desire to improve the well-being of others (e.g., Anthony & Ord, 2008; Brookhart & Freeman, 1992; Tomšik, 2016).

Several theories of motivation are relevant to the learning domain (Brophy, 2013). Expectancy-value theory explains how motivation influences students' choice of achievement tasks, persistence on those tasks, and performance on them (Wigfield & Eccles, 2000). This theory states that individuals' choice, persistence, and performance can be explained by their beliefs about how well they will do on the activity (i.e., expectancies for success) and the extent to which they value the activity or task (i.e., values; Wigfield & Eccles, 2000). Expectancies and values are influenced by ability beliefs, the perceived difficulty of different

tasks, and individual goals (Eccles & Wigfield, 2002). Expectancies and values have a direct influence on achievement choices, performance, effort, and persistence (Wigfield & Eccles, 2000). Different components of achievement values have been defined: (a) attainment value or importance of doing well, (b) intrinsic value or enjoyment from doing the task, (c) utility value or usefulness of the task, and (d) perceived cost to finish the task (Wigfield et al., 2020).

Motivation in MOOCs

Studying motivation in MOOCs, it is important to understand the value and worth of the MOOC for the participant (Macdonald & Ahern, 2015). A wide range of motivations for using MOOCs has been described (Kizilcec & Schneider, 2015; Luik et al., 2019; Milligan & Littlejohn, 2017; Zheng et al., 2015). It has been found that the learners who enroll in MOOCs tend to have different motivations than learners in traditional courses (Watted & Barak, 2018). Learners in MOOCs may not be focused on gaining a certificate of completion (Kizilcec et al., 2013) as course completion and certification is merely one of many potential outcomes of MOOC participation (Zheng et al., 2015). Learners can choose only parts of a MOOC according to their goals and interests (Kizilcec & Schneider, 2015; Wang & Baker, 2015; White et al., 2015).

Several studies have attempted to identify and describe the major motives in MOOCs and have proposed different lists. Zheng et al. (2015) named four types of MOOC learner motivation: (a) fulfilling current needs, (b) satisfying curiosity, (c) preparing for the future, and (d) connecting with people. Watted and Barak (2018) grouped participants' motivating factors into three themes—career benefits, personal benefits, and educational benefits—and found that the general interest category, under the personal benefit theme, and professional competence, under career benefits, were the major motivating factors. General interest in the topic, desire for growth and enrichment, and an expectation to have fun and be challenged were the major motivating forces reported by Kizilcec and Schneider (2015). Milligan and Littlejohn (2017) identified nine types of motivation for participating, with four primary motives: (a) the opportunity to learn about the topic, (b) general interest in the topic, (c) the relevance of the course topic to current role challenges, and (d) its relevance to future career intention. White et al. (2015) identified seven types of reasons for choosing a MOOC, including the following three most marked reasons: (a) MOOCs are free and open, (b) knowledge update, and (c) interest in topic. Luik et al. (2019) composed a scale for measuring motivation with seven factors, wherein the highest-rated motivational factors were interest in and expectations for the course, personal suitability of distance learning, and suitability for family and work.

The diversity of motivations can help predict persistence in a MOOC. Luik et al. (2018) found that the factors (a) interest and expectancies for course, (b) personal suitability of distance learning, (c) usefulness related to certification, and (d) social influence were rated higher by completers than by non-completers. Chaw and Tang (2019) showed that positive motivation (which consists of three elements: believing and having confidence in one's ability to perform well; valuing learning for its usefulness, importance, and relevance; learning to solve problems and develop skills) led to positive engagement, which promotes an increased tendency to complete MOOCs. Evans et al. (2016) claimed that participants who were motivated by their curiosity about online courses or by professional reasons tended to not persist. Wang and Baker (2015) showed that completers were more interested in the course content, whereas non-completers tended to be more interested in MOOCs as a type of learning experience. On the other hand, Douglas et al. (2020) argued that the scores of the Expectancy-Value-Cost motivation scale had only limited predictive power on

performance, and Breslow et al. (2013) even stated that there were no correlations between motivation for enrollment and success in the course.

Classifying MOOC Participants Based on Motivation and MOOC Completion

A few studies have tried to classify MOOC participants according to their motivation and to look at specific completion data of the identified groups of participants. The methods used have included quantitative approaches, such as cluster analysis (Maya-Jariego et al., 2019) or data mining with clustering techniques (Gallén & Caro, 2017), as well as qualitative techniques, such as inductive content analysis (Barak et al., 2016).

Based on content analysis of e-mail messages and forum posts, Barak et al. (2016) identified five types of MOOC completers according to their learning motivation. Networkers wish to meet people with similar interests. Problem-solvers seek to find a solution for a real problem from their work. Benefactors learn for the benefit of others and want to contribute to society. 'Innovation-seekers desire to stay constantly updated and informed. Complementary-learners are students who take the MOOC to broaden and deepen their curriculum.

Gallén and Caro (2017) used clustering techniques in order to better understand the external regulation and motivations of MOOC participants. They identified three motivational profiles they labeled as convinced, cautious, and irrelevant. Convinced participants did not consider the course a waste of time, wanted to do it, and would not prefer doing other things. Also, they did not lose face in front of others, did not consider that others thought badly of them, and did not get in a lot of trouble. Irrelevant participants felt a little guilty for not doing the course, a little ashamed of themselves, and thought that people might think badly about them. Cautious participants did not cluster items with high prevalence and their answers on a seven-point Likert-type scale were mostly of the *applies somewhat to me* variety. Their highest-rated item was *somewhat preferring to do other things*.

Maya-Jariego et al. (2019) classified participants based on motivation and learning intention. Three profiles of involvement in the course were identified: low interest, self-referential, and high commitment. All three profiles demonstrated significant differences in self-reported learning experiences at the end of the course. It was hypothesized that a significant predictor of differential dropout rates can be the motivation stated at the beginning of the course.

Research Aim and Questions

Maya-Jariego et al. (2019) used motivation and intent to complete MOOC as a diagnosis of drop-out. This study went further. We aimed to outline the main motivation clusters of participants in a computer programming MOOC, and to compare how these clusters differed in intention to complete and in completion rate. The study was based on the following research questions:

1. What kind of learner subgroups (clusters) can be identified based on motivation?

2. How do these clusters differ in intention to complete and in completion rates?

Methodology

The Estonian-language computer programming MOOC named *Introduction to Programming* (in Estonian *Programmeerimise alused*) lasted for eight weeks, with an expected total workload of 78 hours. The course was designed for learners with little or no programming experience. The MOOC gave an overview of some programming techniques and taught the basics of algorithmic thinking. So far, this MOOC has been organized five times since the winter of 2016 and the completion rate has been over 50% (Lepp et al., 2017).

Sample and Data Collection

The sample consisted of 1,181 respondents (571 male and 610 female) who enrolled in the Estonian-language MOOC *Introduction to Programming* organized by University of Tartu in the fall of 2018. Participants completed a pre-course questionnaire. Answering the questionnaire was voluntary and was not a prerequisite for passing the MOOC. The youngest participant was 10 years of age and the oldest was 70; the mean age of the participants was 32.4 years (SD = 10.82). Most of the participants had bachelor's (28.4%) or master's (29.8%) degrees. Of the participants, 64.2% were working and 25.9% were students. More than half of the participants (53.7%) had not learned programming before and 21.6% had learned it only by themselves. Of those who filled in the pre-course questionnaire, 700 (59.3%) went on to complete the MOOC.

As in several previous studies (e.g., Kizilcec & Schneider, 2015; Zheng et al., 2015) this research used a quantitative approach to study motivation. Motivation was measured with a Factors Influencing Enrolment in MOOC (FIEM) scale based on expectancy-value theory (Eccles & Wigfield, 2002). According to the results from confirmatory factor analysis, the scale consisted of 28 items, divided by 7 factors describing internal, external, and altruistic motivation; suitability of online learning; and social influence (Luik et al., 2019). This scale was chosen because it was based on motivational theory and covered different areas of motivation. A description of the scale with sample items is presented in Table 1.

The prefacing statement to all motivational items was "What did motivate you to enroll in the MOOC?", and all motivational items were presented on a 7-point Likert scale ranging from 1 (*totally disagree*) to 7 *(totally agree*).

Table 1

Description of the Questionnaire Instrument

Factor	Number of items	Examples	Cronbach's alpha
Interest in and expectations of the course	8	I get more knowledge from this course I can participate in a course with excellent instructors I am interested in that topic	.812
Personal suitability of distance learning	4	I can choose the time, when I study Learning, where I do not actually have to meet other people, suits me	.799
Suitability for family and work	2	I can combine learning with work I can combine learning with family life	.762
Importance and perceived ability	6	I need that knowledge in real life I know that I do well in this topic	.814
Usefulness related to certification	4	I can get a certificate from the university I can show it to the employer as good professional development	.733
Social influence	2	My friends think that I would be successful at this course Members of my family think that I would be successful at this course	.922
Usefulness related to own children	2	I would like to help my children in their programming studies After attending the course I will understand my children who have programming skills	.805

The questionnaire ended with questions about background data, and self-evaluation of the probability of completing the MOOC in percentage terms in order to measure the intention to complete. Data about actual completion or non-completion of the MOOC was taken from the Moodle learning platform.

Data Analysis

SPSS version 25.0 was used for statistical data analysis. First, composite scores of individual items from the FIEM scale were calculated based on seven factors (Luik et al., 2019). The second step focused on building motivation clusters from composite score results of the FIEM scale. This was done by conducting a k-mean cluster analysis with the Euclidean distance and with a maximum of 10 iterations. Cluster analysis was used to group respondents based on motivational factors. As k-means cluster analysis is conducted with different numbers of clusters to find a solution that is the most meaningful in the research context (Jain, 2010), we tested the cluster models with three, four, and five clusters.

In the last phase, general linear models (multivariate and repeated measures) were used to describe differences between clusters. ANOVA (comparing intention to complete, which was measured in percentages) and chi-square test (comparing proportion of completers and non-completers) were used to answer the second research question.

Results

Based on the k-means cluster analysis, the respondents were divided into four groups according to their motivation at time of enrolling in the programming MOOC. The most meaningful results were obtained with four identified clusters, which showed the differences among the respondents (Table 2).

Table 2

Descriptive Data of Motivation Clusters

Factor	Cluster 1 (Opportunity motivated)		Cluster 2 (Over-motivated)		Cluster 3 (Success motivated)		Cluster 4 (Interest motivated)	
	n = 327		*n* = 338		*n* = 232		n = 284	
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Social influence	5.1	1.25	5.7	1.15	4.7	1.22	1.7	0.94
Interest in and expectations of the course	6.3	0.58	6.5	0.49	5.8	0.77	5.7	0.87
Personal suitability of distance learning	6.0	0.81	6.1	0.72	5.2	1.03	5.4	1.14
Suitability for family and work	6.4	0.73	6.3	0.91	3.4	1.21	4.9	1.77
Importance and perceived ability	5.1	0.91	5.7	0.83	4.7	0.95	4.0	1.05
Usefulness related to certification	4.6	1.21	5.4	1.07	4.1	1.18	3.2	1.21
Usefulness related to own children	1.8	1.08	5.3	1.15	2.2	1.39	2.2	1.54

The first cluster comprised 27.7% of all respondents. They gave the highest ratings to the motivational factor Suitability to family and work (significantly different from other factors in all cases $p < .05$). Their ratings were also high for the factors Interest in and expectations of the course and Personal suitability of distance learning (difference between each other and from other factors $p < .05$). The factors Suitability to family and work and Personal suitability of distance learning were also rated higher compared with other clusters, except cluster 2. It seems that, for these participants, taking a MOOC or another e-learning course can be the only possibility or a suitable opportunity to study an interesting topic. We named this cluster Opportunity motivated.

The second cluster (28.6% of respondents) was identified as Over-motivated. They rated almost all motivational factors higher than did members of other clusters ($p < .05$). Only in the case of factors Suitability to family and work and Personal suitability of distance learning was there no statistically significant difference with cluster 1. All the factor means were over 5.

The smallest cluster (19.6% of respondents) was cluster 3. The highest-rated factors in this cluster included Interest in and expectations of the course, Personal suitability of distance learning (difference from other factors in both cases $p < .05$), Importance and perceived ability, and Social influence. The latter two were not significantly different from each other ($p > .05$), but different from other factors (all $p < .05$). Because items such as *I get more knowledge from this course*, *I need that knowledge in real life*, *I know that I do well in this topic*, and *members of my family think that I would be successful at this course* belonged to these factors, we named this cluster Success motivated. Compared with clusters 1 and 2, the ratings in this cluster were all statistically lower (all $p < .05$).

The fourth and last cluster included 24.0% of the participants. Compared with clusters 1 and 2, the respondents in this cluster gave lower ratings to motivational factors. The Social influence factor was the lowest rated among all clusters and was also the lowest rated in this cluster compared with other factors (all $p < .05$). The factors Importance and perceived ability and Usefulness related to certification were also rated lower than in other clusters (all $p < .05$). Learners in this cluster could be described as interested in the topic, as well as being people for whom this type of learning was suitable and significant others did not play a role in their enrollment in the MOOC. We identified this cluster as Interest motivated.

Comparing the clusters in terms of self-evaluated probability of completing the MOOC in percentages (Table 3), it was found with ANOVA that there was a statistically significant difference in evaluations between the clusters ($F = 15.228$, $p < .001$). Bonferroni Post Hoc tests indicated that Interest motivated learners evaluated the probability of completing the MOOC lower than did learners from the Opportunity motivated and Over-motivated clusters (in both cases $p < .001$). Over-motivated learners also evaluated the probability of completing the MOOC higher than did the Success motivated group ($p < .01$). There were no other statistically significant differences between the clusters (all $p > .05$).

Table 3

Self-Evaluated Probability of Completing the MOOC in Percentages by Clusters

Cluster	min	max	*M*	*SD*
Opportunity motivated	45	100	89.0	11.75
Over-motivated	50	100	90.3	12.11
Success motivated	30	100	85.0	14.43
Interest motivated	7	100	83.4	16.86
Total	7	100	87.4	14.01

Significant differences emerged when we compared the percentages of respondents in three clusters according to completion rate (Table 4). The percentage of completers was significantly higher than the percentage of non-completers in the Opportunity motivated, Success motivated, and Interest motivated clusters. There was no significant difference in the Over-motivated cluster.

The results also indicated that the percentage of learners in the Opportunity motivated and Interest motivated clusters who completed the MOOC was statistically higher than the respective proportion of completers in the Over-motivated cluster (accordingly, chi-square 6.829, $p = .001$ and chi-square 5.454, $p = .020$).

Table 4

Comparison of Percentages of Completers and Non-Completers in the Clusters

Cluster	*n*	Completers	Non-completers	Difference in percentages of completers and non-completers	
				chi-square	*p*
Opportunity motivated	327	215 (65.7%)	112 (34.3%)	32.443	<.001
Over-motivated	338	178 (52.7%)	160 (47.3%)	.959	.328
Success motivated	232	131 (56.5%)	101 (43.5%)	3.879	.049
Interest motivated	284	176 (62.0%)	108 (38.0%)	16.282	<.001
Total	1181	700 (59.3%)	481 (40.7%)	40.610	<.001

The proportion of completers in the Opportunity motivated cluster was also significantly higher than in the Success motivated cluster (chi-square 4.959, p =.026). There was no statistically significant difference in completion rates between the Opportunity motivated and Interest motivated (chi-square .941, p = .332), Success motivated and Interest motivated (chi-square 1.607, p = .205), and Over-motivated and Success motivated (chi-square .801, p = .371) clusters.

Discussion

The aim of this study was to outline the main motivation clusters of participants in a computer programming MOOC, and to compare how these clusters differ in completion rate. The FIEM scale (Luik et al., 2019) based on expectancy-value theory (Eccles & Wigfield, 2002) was used to form clusters of MOOC learners according to their motivation to enroll in the MOOC.

As an answer to the first research question—What kind of learner sub-groups (clusters) can be identified based on motivation?—we found four clusters of learners. Previous studies have identified three (Gallén & Caro, 2017; Maya-Jariego et al., 2019) or five (Barak et al., 2016) clusters, but they used different motivational scales (Gallén & Caro, 2017; Maya-Jariego et al., 2019) or were based only on e-mails and

forum posts as data sources (Barak et al., 2016). It was interesting that the highest proportion of learners belonged to the cluster named Over-motivated, as they rated almost all motivational factors higher than did members of the other clusters. This finding aligned with the result of Maya-Jariego et al. (2019), who found that more than half of MOOC participants were highly motivated.

Opportunity motivated learners take advantage of e-learning courses, including MOOCs. They like distance learning and, due to family and work commitments, this kind of learning can be for them the only option for studying interesting topics. In terms of size, this cluster was just a little smaller than the Over-motivated cluster. The opportunity to learn about the topic was also mentioned as one of the four primary motives in a previous study (Milligan & Littlejohn, 2017) and suitability of this kind of learning was among the three highest rated motivational factors in Luik et al. (2019).

Almost a quarter of learners belonged to the Interest motivated cluster—learners interested in the topic who find distance learning suitable for them and decided by themselves to enroll in the MOOC. It was interesting that only a quarter of the participants belonged to this cluster because interest has been reported as one of the highest motivational factors (Kizilcec & Schneider, 2015; Luik et al., 2019; Milligan & Littlejohn, 2017; White et al., 2015). These learners were not influenced by others; a similar cluster was found in a previous study (Maya-Jariego et al., 2019), where the self-referential cluster was also described as people who felt less pressured by the opinion of family and friends.

The smallest cluster, Success motivated, could be described as people oriented towards getting more benefit from the course. They and their significant others believe that they can be successful studying this topic. Barak et al. (2016) identified a similar cluster, named benefactors. Like our Success motivated cluster, they wanted to learn for their own benefit, but according to the previous study (Barak et al., 2016) they also wanted to contribute to society, which was not a trait identified in our study. A previous study (Chaw & Tang, 2019) also observed that confidence in one's ability to perform well and valuing learning for its usefulness leads to increased tendency to complete MOOCs.

Second, we examined differences among the clusters according to the intention to complete the MOOC and according to completion rates. Interest motivated respondents evaluated their probability of completing the MOOC lower than did the Opportunity motivated and Over-motivated respondents. This could be related to the tendency of some learners to choose only parts of MOOC according to their interests (Kizilcec & Schneider, 2015; Wang & Baker, 2015; White et al., 2015). Therefore, it is possible that they simply intend to satisfy their curiosity and, as a result, they know that they are not very likely to complete the MOOC. Maya-Jariego et al. (2019) argued that the intention to initiate and complete a MOOC was highest in a highly motivated cluster, which was supported by our study. Over-motivated learners evaluated their probability of completing the MOOC higher than did Interest motivated and Success motivated respondents.

Unlike the findings of Breslow et al. (2013), our results indicated that motivation for enrollment is related to completion of the course. The comparison of completion rates indicated that the proportion of completers was higher than the proportion of non-completers in all clusters, except for the Over-motivated. The result that almost two-thirds of learners from the Opportunity motivated cluster completed the course indicated that this type of motivation seems to be the most beneficial for completing a MOOC. Learners who are

comfortable with distance learning might be better equipped to cope with the difficulties of a MOOC, to keep motivated and, therefore, complete the MOOC (Luik et al., 2018).

More than 60% of the participants in the Interest motivated cluster completed the MOOC. Also, the results indicated that the intention to complete is not related to actual completion. While Interest motivated learners evaluated their probability of completing the MOOC almost the lowest, the completion rate in this cluster was higher than among Over-motivated learners and not significantly different from the other clusters. The results of previous studies about the relationships between interest and completion have been inconsistent. For example, Luik et al. (2018) found that completers rated interest-related motivational items higher than did non-completers, but the findings of Evans et al. (2016) indicated that MOOC learners motivated by curiosity tended to drop out. Interest in the course content leads to completion, but interest in MOOCs as a special type of learning did not (Wang & Baker, 2015). Consequently, it seems that the interaction between interest and completion needs further study.

An interesting finding was that learners in the Over-motivated cluster, having reported the highest motivation, dropped out more than did Opportunity motivated and Interest motivated participants. Maya-Jariego et al. (2019) claimed, based on intention to complete, that motivation expressed before the course was a relevant predictor of varying dropout rates and learners with higher motivation at the beginning of the MOOC were more likely to complete. However, our results did not support this statement. Also, it seems that orientation to success is not particularly beneficial for completing a MOOC.

Conclusion and Implications

Our findings can be useful for MOOC instructors, as a better vision of participants' motivational profiles at the beginning of the MOOC might help to design better supports for different learners and result in lower dropout rates. Learners who are highly motivated at the beginning of a MOOC might get less attention because it is assumed that they do not need so much outside support. However, our results indicated that learners with high motivation in all areas tended to drop out. The reason might be that, compared with others, they had a less clear idea about why they needed this MOOC.

The other group of learners needing more attention includes those who believe that they can be successful in the subject area of the MOOC, partially because they are convinced by their family members and friends. However, merely believing in success does not help one complete a MOOC and such learners may be more prone to being distracted when difficulties arise.

The study has some limitations that must be taken into account. The number of participants was low compared with the number of participants commonly found in MOOCs, but the participation rate was still considerable. Also, this MOOC was about computer programming and with a higher completion rate than the average; the results may be not generalizable to other MOOCs. Furthermore, as is usual in studies on motivation, we used a self-reported scale.

In future studies, it would be interesting to extend our work and explore larger samples and MOOCs with different topics. Additionally, considering the globality of MOOCs, it would be relevant to analyze the

motivation to learn and completion rates among culturally diverse learners. The relationships between motivation and completion need more attention in future investigations, because it is still not clear how interest influences completion. Also, the actual reasons for highly motivated participants dropping out are still vague and could, therefore, prove to be a very beneficial avenue of research.

References

Anthony, G., & Ord, K. (2008). Change-of-career secondary teachers: Motivations, expectations and intentions. *Asia-Pacific Journal of Teacher Education*, *36*(4), 359–376. https://doi.org/10.1080/13598660802395865

Barak, M., Watted, A., & Haick, H. (2016). Motivation to learn in massive open online courses: Examining aspects of language and social engagement. *Computers & Education*, *94*, 49–60. https://doi.org/10.1016/j.compedu.2015.11.010

Breslow, L. B., Pritchard, D. E., DeBoer, J., Stump, G. S., Ho, A. D., & Seaton, D. T. (2013). Studying learning in the worldwide classroom: Research into edX's first MOOC. *Research & Practice in Assessment*, *8*, 13–25. http://www.rpajournal.com/studying-learning-in-the-worldwide-classroom-research-into-edxs-first-mooc/

Brookhart, S. M., & Freeman, D. J. (1992). Characteristics of entering teacher candidates. *Review of Educational Research, 62*(1), 37–60. https://doi.org/10.2307/1170715

Brophy, J. E. (2013). *Motivating students to learn*. Routledge.

Chaw, L. Y., & Tang, C. M. (2019). Driving high inclination to complete massive open online courses (MOOCs): Motivation and engagement factors for learners. *The Electronic Journal of e-Learning*, *17*(2), 118–130. https://eric.ed.gov/?id=EJ1221333

Daza, V., Makriyannis, N., & Rovira Riera, C. (2013). MOOC attack: Closing the gap between pre-university and university mathematics. *Open Learning: The Journal of Open, Distance and e-Learning*, *28*(3), 227–238. https://doi.org/10.1080/02680513.2013.872558

Deci, E. L., Koestner, R., & Ryan, R. M. (2001). Extrinsic rewards and intrinsic motivation in education: Reconsidered once again. *Review of Educational Research*, *71*(1), 1–27. https://doi.org/10.3102/00346543071001001

Douglas, K. A, Merzdorf, H. E., Hicks, N. M., Sarfraz, M. I., & Bermel, P. (2020). Challenges to assessing motivation in MOOC learners: An application of an argument-based approach. *Computers & Education*, *150*. https://doi.org/10.1016/j.compedu.2020.103829

Eccles, J. S., & Wigfield, A. (2002). Motivational beliefs, values, and goals. *Annual Review of Psychology*, *53*(1), 109–132. https://doi.org/10.1146/annurev.psych.53.100901.135153

Evans, B. J., Baker, R. B., & Dee, T. S. (2016). Persistence patterns in massive open online courses (MOOCs). *The Journal of Higher Education*, *87*(2), 206–242. https://doi.org/10.1080/00221546.2016.11777400

Feklistova, L., Lepp, M., & Luik, P. (2019). Completers' engagement clusters in programming MOOC: The case of Estonia. In L. Gómez Chova, A. López Martínez, & I. Candel Torres (Eds.), *ICERI 2019*

Proceedings: 12th annual international conference of education, research and innovation (pp. 1119–1126). IATED.

Gallén, R. C., & Caro, E. T. (2017). An exploratory analysis of why a person enrolls in a massive open online course within MOOCKnowledge data collection. *IEEE Global Engineering Education Conference* (pp. 1600–1605). https://doi.org/10.1109/EDUCON.2017.7943062

Green, J., Liem, G. D., Martin, A. J., Colmar, S., Marsh, H. W., & McInerney, D. (2012). Academic motivation, self-concept, engagement, and performance in high school: Key processes from a longitudinal perspective. *Journal of Adolescence*, *35*, 1111–1122. https://doi.org/10.1016/j.adolescence.2012.02.016

Grover, S., Franz, P., Schneider, E., & Pea, R. (2013). The MOOC as distributed intelligence: Dimensions of a framework & evaluation of MOOCs. *10th International Conference on Computer Supported Collaborative Learning*. https://www.researchgate.net/publication/275771115_The_MOOC_as_Distributed_Intelligence_Dimensions_of_a_Framework_Evaluation_of_MOOCs

Huitt, W. (2011). Motivation to learn: An overview. *Educational Psychology Interactive*. Valdosta State University. http://www.edpsycinteractive.org/topics/motivation/motivate.html

Jain, A. K. (2010). Data clustering: 50 years beyond K-means. *Pattern Recognition Letters*, *31*(8), 651–666. https://doi.org/10.1016/j.patrec.2009.09.011

Kahan, T., Soffer, T., & Nachmias, R. (2017). Types of participant behavior in a massive open online course. *International Review of Research in Open and Distributed Learning*, *18*(6), 1–18. https://doi.org/10.19173/irrodl.v18i6.3087

Kizilcec, R. F., Piech, C., & Schneider, E. (2013). Deconstructing disengagement: Analyzing learner subpopulations in massive open online courses. In D. Suthers, K. Verbert, & E. Duval (Eds.), *Proceedings of the third international conference on learning analytics and knowledge* (pp. 170–179). https://doi.org/10.1145/2460296.2460330

Kizilcec, R. F., & Schneider, E. (2015). Motivation as a lens to understand online learners: Toward data-driven design with the OLEI scale. *ACM Transactions on Computer-Human Interactions*, *22*(2). https://doi.org/10.1145/2699735

Lepp, M., Luik, P., Palts, T., Papli, K., Suviste, R., Säde, M., & Tõnisson, E. (2017). MOOC in programming: A success story. In L. Campbel & R. Hartshorne (Eds.), *Proceedings of the International Conference on e-Learning (ICEL;* pp. 138–147). Academic Publishing International (API).

Luik, P., Lepp, M., Palts, T., Säde, M., Suviste, R., Tõnisson, E., & Gaiduk, M. (2018). Completion of Programming MOOC or Dropping out: Are There any Differences in Motivation? In K. Ntalianis, A. Andreatos, and C. Sgouropoulou (Eds.), *Proceedings of the 17th European Conference on e-*

Learning ECEL 2018 (pp. 329–337). Academic Conferences and Publishing International Limited Reading.

Luik, P., Suviste, R., Lepp, M., Palts, T., Tõnisson, E., Säde, M., & Papli, K. (2019). What motivates enrolment in programming MOOCs? *British Journal of Educational Technology*, *50*(1), 153–165. https://doi.org/10.1111/bjet.12600

Macdonald, P., & Ahern, T. C. (2015). Exploring the instructional value and worth of a MOOC. *Journal of Educational Computing Research*, *52*(4), 496–513. https://doi.org/10.1177/0735633115571927

Maya-Jariego, I., Holgado, D., González-Tinoco, E., Castaño-Muñoz, J., & Punie, Y. (2019). Typology of motivation and learning intentions of users in MOOCs: The MOOCKNOWLEDGE study. *Educational Technology Research and Development*, *68*, 203–224. https://doi.org/10.1007/s11423-019-09682-3

Milligan, C. & Littlejohn, A. (2017). Why study on a MOOC? The motives of students and professionals. *The International Review of Research in Open and Distributed Learning*, *18*(2). https://doi.org/10.19173/irrodl.v18i2.3033

Orhan Özen, S. (2017). The effect of motivation on student achievement. In E. Karadag (Ed.), *The factors effecting student achievement* (pp. 35–56). https://doi.org/10.1007/978-3-319-56083-0_3

Pintrich, P. R. (2003). A motivational science perspective on the role of student motivation in learning and teaching contexts. *Journal of Educational Psychology*, *95*, 667–686. https://doi.org/10.1037/0022-0663.95.4.667

Reparaz, C., Aznárez-Sanado, M., & Mendoza, G. (2020). Self-regulation of learning and MOOC retention. *Computers in Human Behavior*, *111*. https://doi.org/10.1016/j.chb.2020.106423

Tomšik, R. (2016). Choosing teaching as a career: Importance of the type of motivation in career choices. *TEM Journal, 5*(3), 396–400. https://doi.org/10.18421/TEM53-21

Tseng, S., Tsao, Y., Yu, L., Chan, C., & Lai, K. R. (2016). Who will pass? Analyzing learner behaviors in MOOCs. *Research and Practice in Technology Enhanced Learning*, *11*(8), 1–11. https://doi.org/10.1186/s41039-016-0033-5

Wang, Y., & Baker, R. (2015). Content or platform: Why do students complete MOOCs? *Journal Of Online Learning & Teaching*, *11*(1), 17–30. https://jolt.merlot.org/vol11no1/Wang_0315.pdf

Watted, A., & Barak, M. (2018). Motivating factors of MOOC completers: Comparing between university-affiliated students and general participants. *The Internet and Higher Education*, *37*, 11–20. https://doi.org/10.1016/j.iheduc.2017.12.001

White, S., Davis, H., Dickens, K., Leon, M., & Sanchez-Vera, M. M. (2015). MOOCs: What motivates the producers and participants? In S. Zvacek, M. Restivo, J. Uhomoibhi, & M. Helfert (Eds.),

Computer supported education: CSEDU 2014 (pp. 99–114). https://doi.org/10.1007/978-3-319-25768-6_7

Wigfield, A., & Eccles, J. S. (2000). Expectancy-value theory of achievement motivation. *Contemporary Educational Psychology*, *25*(1), 68–81. https://doi.org/10.1006/ceps.1999.1015

Wigfield, A., Eccles, J. S., & Möller, J. (2020). How dimensional comparisons help to understand linkages between expectancies, values, performance, and choice. *Educational Psychology Review*, *32*(3), 657–680. https://doi.org/10.1007/s10648-020-09524-2

Zheng, S., Rosson, M. B., Shih, P. C., & Carroll, J. M. (2015). Understanding student motivation, behaviors and perceptions in MOOCs. *Proceedings of the 18th ACM conference on computer supported cooperative work & social computing* (pp. 1882–1895). https://doi.org/10.1145/2675133.2675217

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Comparative Analysis of Operational Structures in Single- and Dual-Mode Distance Learning Institutions in Nigeria

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Abstract

This study examined the similarities and differences in the processes and facilities for distance education at National Open University of Nigeria (NOUN), a single-mode distance learning institution, and Obafemi Awolowo University (OAU), Ile-Ife, a dual-mode distance learning institution. The study adopted a case study research design, with a population of administrators/facilitators and distance learning students at both NOUN and OAU. The sample for the study consisted of 38 key informants (30 administrators/facilitators and 8 students) selected using a purposive sampling technique. All the administrators/facilitators responded to a key informant questionnaire; 8 of the administrators/facilitators and all 8 students were also interviewed. The 16 interviewees were selected based on gender, institution, educational role, and mode of distance learning. The collected data were analysed using tabular juxtaposition and phenomenological analysis techniques. Results showed that similarities in the operational structures at NOUN and OAU included the use of blended learning approaches. Differences in operations included compulsory tutorial attendance at OAU and the deployment of part-time and quasi part-time facilitators at NOUN and OAU, respectively. The study recommended an increase in the use of information and communications technology (ICT).

Keywords: operational structures, single-mode, dual-mode, distance learning institutions, Nigeria

Introduction

Distance education has been defined as formal learning in which the learner and the facilitator are separated in time and space (Bušelić, 2012). It encompasses part-time courses/studies, open and distance learning, and online education, and especially for post-secondary education, distance learning and digital learning/education. In the Nigerian education system, distance education was conceptualised as "all-inclusive contact, no contact and part-time education . . . the mode of teaching in which learners [are] removed in time and space from the teacher" (Federal Republic of Nigeria [FRN], 2004, p. 38). Nigeria's national policy on education (FRN, 2004, 2013) acknowledged the need for a variety of media and technologies. Operational structures referred to the institution's defined chains of activities and processes as these relate to the conduct of admission, course registration, instructional delivery, staffing, examinations, and certification towards achieving the learner's needs and institution's goals. Nigeria is the most populous and the largest economy in Africa (Akinwale & Onwuamaeze, 2020; Naido, 2020; Terwase, Abdul-Talib & Zengeni, 2014). The country's vast geographical, socio-cultural, and ethnolinguistic diversities make higher education through distance learning desirable and imperative. Distance education creates an opportunity for lifelong learning, life-wide education, mass and media education, self-directed learning, personalised learning, and part-time studies. Distance education programmes also allow higher institutions to optimally utilise their facilities.

The National Open University of Nigeria (NOUN) is the only dedicated distance learning university in the country (Okonkwo, 2012) while OAU, Ile-Ife, is one of the institutions that provides university education through traditional and distance education modes (Oyeleke & Apena, 2018). The motto of NOUN is *Work & Learn*. NOUN was founded in 1983 but did not become fully functional until 2002. OAU, Ile-Ife, was founded in 1962 and its motto is *For Learning and Culture*. This comprehensive public institution has aspired to be the technological flagship of the West African sub-region in teaching, research, and community service. Today, OAU is a leader in ICT at the university level in Nigeria, and one of the few accredited dual-mode institutions offering higher education through distance learning in Nigeria (Agyeman, 2007; Onwe, 2013). It does this through its Centre for Distance Learning (CDL) and the Institute of Education (IED). In 2014, the CDL commenced coordinating the university's online degree programmes in various fields of study while the IED coordinated part-time degree programmes in education courses. Nigeria's federal government own and finance NOUN and OAU.

Despite the enthusiasm for distance education among Nigeria's tertiary institutions, some uncertainties and concerns remain about the type, scope, and nature of distance education provision in Nigeria. There are concerns about infrastructural inadequacy, organisational and operational modes, among others (Biao, 2012; Ikegulu & Oranusi, 2014; Oyeleke & Apena, 2018). It may be that many prospective distance learners do not have adequate information or sufficient understanding of the operational modes of varied distance learning institutions with regards to their instructional delivery methods, facilities, as well as patterns of learners' and facilitators' activities. It appears these misconceptions make some people assume that distance learning is a second-best option (Gaskel & Mills, 2015) even though studies such as Tucker's (2001) have proved that distance education could be as effective as traditional education.

Obioha and Ndidi (2011) and Ezekoka (2015) investigated some aspects of the administrative and operational structures of NOUN. Meanwhile, extant literature has shown little evidence of works on

distance education that juxtapose dual-mode and single-mode institutions using a mixed methods approach. Many previous studies have focused on comparing trends and practices in different countries (Adanir et al., 2020; Srivastava, 2002; Zormanová, 2016) and comparing distance education and conventional education (Abdulsalam et al., 2017; Adeleke & Adesina, 2018; Ahn & McEachin, 2017; Anderle, 2018; Anderson & Cuttler, 2020; Duffy et al., 2002; López Soblechero et al., 2014; Olakulehin & Panda, 2011; Paul & Jefferson, 2019). A recent study compared single- and dual-mode institutions in Pakistan, and analysed how distance learners' assignments were assessed (Akter & Ali, 2016). Institutions' operational structures need to be examined and understood to empirically show how this aspect has contributed to the development of modern distance education in Nigeria. Importantly, understanding the operational structures in single- and dual-mode distance learning institutions would help to better position distance education in the society that is sceptical of it; hence, this study. The study answered the following question: what are the similarities and differences in the processes and facilities for distance learning in single- and dual-mode distance learning institutions in Nigeria, specifically at NOUN and OAU? The objectives of the study were to identify, describe, and compare the operational structures (i.e., processes and facilities) at NOUN and OAU.

Overview of Distance Learning in Nigeria

Education policymakers in Nigeria envisaged the need for a mode of education that would increase access and opportunities to formal learning for personal development and the ultimate betterment of society. Such provision was based on the principles of equity, egalitarianism, as well as the need for lifelong learning for Nigerian adult citizens. The National Policy on Education (FRN, 2013, Section 6) provided for open and distance education and emphasised that this kind of education delivery system be encouraged and promoted at different levels and for varied purposes nationwide. According to the FRN (2013, Section 6, paragraph 115), the goals of open and distance education in Nigeria, among others, are access to quality education, equity in educational opportunities, and lifelong learning opportunities. In Nigeria, distance education has been expected to include contact, no contact, part-time, and flexible education, all through deploying a variety of media and technologies (FRN, 2004, 2013).

Even so, necessary and supportive infrastructures such as the regular supply of electricity and efficient telecommunication network have been lacking. E-learning and online education in Nigeria is still a dream because of poor ICT infrastructure and other socio-economic reasons (Agyeman, 2007; Ajadi et al., 2008; Akande & Sofowora, 2011; Commonwealth of Learning [COL], 2001). Meanwhile, Ajadi et al. (2008, p. 1) advised that "the rapid expansion of ICTs in Nigeria offers an opportunity to consider its use in the promotion" of distance education. The Federal Ministry of Education (2000) admitted that following the early start in distance education in the 1950s, there has been a relapse since the 1960s. More than a decade and a half ago, the country began to revamp its distance education potential by developing a 10-year plan of action for distance education in Nigeria, designed to span the years from 2001 to 2010.

Agyeman (2007, citing Nom, 2006) described how each of the NOUN study centres was furnished with a computer laboratory, designed as a cyber cafe with a minimum of 25 computers in a local area network configuration. Temitayo (2012) noted that NOUN also had some special study centres in order to cater to

specialised groups such as prison inmates and armed forces personnel. Agyeman (2007) added that the Government of Nigeria had also ceded to NOUN the educational unit of the Nigeria Television Authority in Tejuosho, Lagos, so as to enable NOUN to televise some of its courses, and that NOUN already used videoconferencing for some course delivery. Ajadi et al. (2008) further reported that NOUN established a radio station in Lagos as one strategy for facilitating its programmes. Ajadi et al., however, recommended that before introducing an advanced ICT at NOUN, research should be conducted on learner's access, cost, and other related and essential parameters. Meanwhile, according to Onwe (2013), NOUN's instructional delivery system was still restricted to the use of printed materials and CD-ROMs with plans to include (a) audiotapes, (b) videotapes, (c) radio and television broadcasts, and (d) computer-mediated learning. According to Ezekoka (2015), NOUN students preferred blended learning to the practice of only face-to-face instruction. However, the constraints to the use of blended learning at NOUN included: (a) students at times felt lonely and isolated when using blended learning, (b) technophobia, (c) students' lack of computer operating skills, (d) high cost of ICT, (e) poor Internet connectivity, and (f) the fact that blended learning required students to devote more time to their studies.

OAU has practiced an integrated, dual-mode model of distance education. OAU's CDL, responsible for facilitating modern distance education, is located in Moro, about seven kilometres away from the main campus in Ile-Ife. The CDL has been furnished with technical infrastructure to cater to the institution's online programmes. OAU is an example of institutions that have made notable efforts in reducing reliance on national infrastructure. Agyeman's (2007) survey recorded that:

> The Obafemi Awolowo University (OAU) boasts of having the best-developed ICT system in the country with its VSAT access to the Internet and a campus-wide intranet. OAU has embarked on the progressive application of ICT to all its functions and services—academic, research, and administrative. The OAU has more than 6,000 users on more than 1,000 computers distributed in 15 computer laboratories across the campus. (p. 7)

OAU's online facility has been aligned with one of the objectives of Nigeria's federal government in its plan for distance education: the establishment of a robust ICT-driven delivery system (Association for the Development of Education in Africa, 2002 in Onwe, 2013). Apart from this, OAU has offered distance education through its IED, which coordinates part-time degree programmes in the Faculty of Education.

Distinguishing Between Single- and Dual-Mode Institutions

As Trindade et al. (2000) stated, the distinction between single- and dual-mode distance learning organisations is a classical one. The former applies to organisations where distance learning activities largely dominate, compared with face-to-face ones. As of 2001, the only example of dedicated distance education institution in Nigeria was the National Teachers' Institute, but it was not a university. However, since 2002, an open university experience has been available only through NOUN. Dual-mode institutions are described as conventional universities with units that organise and operate structured distance education programmes (COL, 2001). Examples of such units have been found in the University of Ibadan, the University of Lagos, the University of Abuja, and OAU. COL (2001) observed that in some institutions,

such as the University of Ibadan, distance education practices were organised by a unit originally set up for adult education.

In a single-mode system, students work mostly by themselves outside the campus; their direct contact with the system occupies just a small fraction of their yearly workload. This is the usual organisational pattern of open universities, also known as dedicated distance learning universities. According to Trindade et al. (2000), when conventional universities decide to operate distance learning methods in some programmes in parallel with their conventional operation, this has constituted a dual-mode system. Trindade et al. affirmed that "this solution has been adopted by an increasing number of traditional universities as a means to provide education to students unable to follow courses regularly on campus, thereby expanding the social usefulness and the geographical radius of their influence" (pp. 4–5).

COL's (2001) report described three major kinds of institutional practice in Nigeria: (a) outreach as distance education, (b) dual-mode institutions, and (c) dedicated distance education institutions. The report admitted that the outreach centres practice did not fall into the ambit of distance education as it was outside international conceptualisation, and the centres were of low and uncoordinated quality. Consequently, the National Universities Commission (NUC) banned the outreach practice. Meanwhile, COL's report strongly emphasised the need to locate distance education units within dual-mode institutions. The report noted that this approach was believed to have physical, psychological, and administrative implications, as it addressed (a) the tendency for distance education to be regarded as a second-best option (which promotes a feeling of inadequacy); (b) the need to generate income for the mother institution for the management of the unit (which could lead to the sacrifice of quality at the altar of money); (c) the tendency for finances to be managed by the central institutional administration; and (d) the tendency for distance education units to rely heavily on course writers who are already employed as full-time lecturers. The approach was also viewed as being advantageous in the sense that it prevented brain drain from the Nigerian university system, allowed distance education programmes to work directly with content experts, and reduced cost.

Conceptual Framework: Distance Education Models

There have long been various groupings of models of distance education. This study hinged on Keegan's (1990, 1996) models of distance education. According to Keegan's typology of distance teaching systems, there are five models of distance education: (a) correspondence school model (Group 1), (b) distance teaching universities or open university model (Group 2), (c) independent study divisions of a conventional college or university (Group 3) integrated model, (d) consortium model (Group 4), and (e) Australian integrated mode or New England model (Group 5). Keegan categorised Groups 1 and 2 under autonomous distance teaching institutions and Groups 3, 4, and 5 under distance education departments of conventional institutions. The fundamental differences among the groupings is in the two categories (Keegan, 1996). The division between Group 2 and 2 "is based on complexity of didactic structure and level of provision" (Keegan, 1996, p. 131).

The correspondence school model relies heavily on the exchange of print materials between the institution and the students, especially at below university level. It appears that with the exponential increase in

technological development and globalisation since the 1990's, this model has gradually faded. In fact, because of the use of "correspondence" in the Act that established NOUN, its graduates were not regarded as equal to graduates of conventional universities until the word was expunged in 2017 (Baiyewu, 2017). In the distance teaching universities or open university model provisions are usually at the tertiary level, although non-degree courses might be offered. There are no students in residence but distance teaching universities in this group are characterised by the use of multimedia and a more comprehensive linking between learning materials and student learning (Keegan, 1996). These are autonomous institutions with floating or adjunct faculty; no part-time/full-time or day-time/night-time dichotomies. Examples of such institutions include The Open University in the UK, Everyman's University in Israel, and the NOUN. At such universities, course writers and tutors are outsourced; learners are reached through a variety of media and methods. There may be additional elements of face-to-face approaches, thereby resulting in a blended or hybrid learning approach. However, because of its demanding capital-intensive nature, only a national government may want to embark on it (Omolewa & Adekanmbi, 1994).

Independent study divisions of a conventional college or university might exist as Continuing Education and Extension Colleges where the responsibility of course development is on the institutions' faculty, albeit in form of paid overload. According to Keegan (1996), students study independently but such mode is not sufficient to acquire a full degree in many cases. Keegan (1996) replaced the consultation model (Keegan, 1990) with the consortium model, but his conceptualisation of the latter only focused on the institutional composition without specifying the didactic processes and provisions. Consortia "bring together universities or university departments, government agencies, business partners, radio, television and media production authorities for the purpose of enrolling students in distance education courses" (Keegan, 1996, p. 139). In any case, this model suggests that learners might carry out distinct activities in more than one institution, such as enrolment in one and didactic consultation in another. Students attend classes and participate in activities at nearby allocated institutions. In the last model, the integrated model, distance teaching is an extension of an already existing internal teaching programme coordinated by "a distinct form of distance education department within a conventional college or university" (Keegan, 1996, p. 140). The same faculty, which are "given a dual mandate" (p. 140) teach and assess sets of students in both the conventional and the distance education systems. In terms of cost, this model is the most manageable. Universities' centres for distance learning are examples of integrated or mixed institutions. Keegan's typology is not watertight and distance teaching systems have significantly evolved in the past three decades. The fact that 'the Australian integrated mode – New England model' now describes a common phenomenon, in Nigeria and other parts of the world, is an example of the evolution. Meanwhile, single-mode and dual-mode institutions broadly correspond to Keegan's autonomous distance teaching institutions and distance education departments of conventional institutions respectively. More specifically, NOUN is an example of distance teaching universities (Group 2) and OAU's CDL and IED are examples of the integrated model (Group 5).

Methodology

The study adopted a case study research design. This design was based on Yin (2003); Yin argued that case studies are favourable when investigating contemporary issues, and when behaviour cannot be controlled,

as in the case of this study. The study population comprised administrators/facilitators and distance learning students at NOUN and OAU. The sample for the study comprised 38 participants (30 administrators/facilitators and 8 students) selected using a purposive sampling technique. Two students were selected from each of NOUN's Ikeja Study Centre (Lagos State) and Osogbo Study Centre (Osun State). These two centres were selected because they were accessible, and because the Ikeja centre was archetypical while the Osogbo centre was closer to Ile-Ife, the host of the second institution. Lagos being the economic nerve centre of Nigeria, the study centres there had the greater potential of drawing students from among people of varied backgrounds. Two students were selected from each of OAU's CDL (online programme) and IED (part-time programme). Furthermore, 15 administrators/facilitators were selected from each of the two institutions. For NOUN, the 15 administrators/facilitators included 8 from the Ikeja Study Centre and 7 from the Osogbo Study Centre. For OAU, the administrators/facilitators included 8 involved in IED programmes and 7 involved in CDL programmes.

Data were obtained through key informant questionnaires, key informant interviews, and desk research. From each of the institutions, 15 administrators/facilitators responded to the questionnaire, and 4 administrators/facilitators and 4 students were interviewed. These 8 interviewees from each institution were selected out of the total sample based on institution, subsystem and educational role, (see Table 1). This selection was made so as to enable comparisons at an institutional level. Collected data were analysed through tabular juxtaposition and phenomenological analysis techniques. The tabular juxtaposition technique provided a bird's-eye view of the comparative findings in the case institutions. The phenomenological analyses related to the perspectives of the individual and was qualitative analysis of narrative data with the goal to describe a lived experience of a phenomenon (Adebisi, 2018; Barrow, 2017). Table 1 summarizes the codes used to identify the 16 interviewees.

Table 1

Codes for Interviews of Participants in the Study

S/N	Interviewee	Code
1	NOUN Lagos Study Centre student 1	NOUN LSCS 1
2	NOUN Lagos Study Centre student 2	NOUN LSCS 2
3	NOUN Osogbo Study Centre student 1	NOUN OSCS 1
4	NOUN Osogbo Study Centre student 2	NOUN OSCS 2
5	NOUN Lagos Study Centre administrator/facilitator 1	NOUN LSCAF 1
6	NOUN Lagos Study Centre administrator/facilitator 2	NOUN LSCAF 2
7	NOUN Osogbo Study Centre administrator/facilitator 1	NOUN OSCAF 1
8	NOUN Osogbo Study Centre administrator/facilitator 2	NOUN OSCAF 2
9	OAU Institute of Education student 1	OAU IEDS 1
10	OAU Institute of Education student 2	OAU IEDS 2
11	OAU Centre for Distance Learning student 1	OAU CDLS 1
12	OAU Centre for Distance Learning student 2	OAU CDLS 2
13	OAU Institute of Education administrator/facilitator 1	OAU IEDAF 1
14	OAU Institute of Education administrator/facilitator 2	OAU IEDAF 2
15	OAU Centre for Distance Learning administrator/facilitator 1	OAU CDLAF 1

16 OAU Centre for Distance Learning administrator/facilitator 2 OAU CDLAF 2

Results and Discussion

Table 2 shows the operational structures (i.e., processes and facilities) identified at NOUN and OAU. Results showed that while NOUN as an open and flexible learning system relied on the use of connected distributed classes, OAU had two autonomous subsystems that provided distance education, namely IED (part-time) and CDL (online).

Table 2

Operational Structures of Distance Education at NOUN (Single Mode) and OAU (Dual Mode)

Item	NOUN	OAU
Where do admission screening, payment of fees, and course registration take place?		
Via the Internet (online)	✓	✓
Study Centre/Unit (for screening)	✓	✓
Institution's headquarters	–	–
What modes of admission are available in the distance education programmes?		
O Level (Senior School Certificate Examination [SSCE])	✓	–
Direct entry with National Diploma (ND), Nigeria Certificate in Education (NCE) and other professional certificates	✓	✓
Access/foundation/pre-degree programmes	✓	–
Major instructional materials/resources used		
Print media (hard and soft copies)	✓	✓
Audio-visual materials (CD, DVD, VCD)	✓	–
Materials programmed on mobile devices	–	✓ (CDL only)
Materials uploaded on the school's website	–	✓ (CDL only)
On which platforms do facilitators have contact with students?		
Online/virtual via e-mail, chat rooms, forums	✓	✓
Online/virtual via teleconference	✓	–
Virtual via radio and television	✓	–
Face-to-face at the campus (weekends and holidays)	–	–
Face-to-face at distributed classes/centres (weekends and holidays)	–	✓
Face-to-face at distributed classes/centres (week days)	–	–
Blended learning (physical and virtual/online meetings)	✓	✓ (CDL only)
As agreed upon by students and facilitators	–	–
To what extent is it compulsory to attend scheduled contacts (classes)?		
Compulsory (rules-based)	–	✓
As facilitators decide	–	–
As the centre coordinator decides	–	–
As the coordinator and students agree	–	–
Not compulsory	✓	–
Where are examinations conducted?		
Physical classroom	✓	✓

Online	✓	–
Both physical and online	✓	–
Flexible (students can choose where and when)	✓	–
Partnership or affiliation with other units within the institution or with other institutions		
Libraries/resource centres (public or private)	✓	–
Other universities/colleges/polytechnics	✓	✓
Other unit(s) within the institution	✓	✓

Note. ✓ = Yes; – = No.

ICT and the Internet: Digitalised Processes

The analysis showed that in both institutions, admission screening, payment of fees, course registration, and other similar processes were done via the Internet. This aligns with the observation by Abdel-Maksoud (2018) that virtualisation technology was increasingly becoming common in education due to its potential to reduce costs, boost efficiency, and overcome limited physical resources. The two institutions were similar with regards to where admission screening, payment of fees, and course registration took place. These processes were predominantly carried out online, also evidenced in the statement that "everything is online" (OAU CDLAF 1). This predominant deployment of online processes sets the tone for why any distance education student these days must be "ICT compliant" (NOUN OSCAF 1) and "ICT conscious" (OAU IEDAF 1). However, physical presence was sometimes required at the institutions' designated offices for such processes, especially for screening. It was often necessary that hard copies of supporting documents and printouts of applications, payments, and registrations be submitted to double-check online activities. Technical hitches occasionally made the NOUN students do more offline than necessary, especially when the electronic portal was down and this made the process "quite stressful" (NOUN LSCS 2).

Modes of Admission

Regarding admission, NOUN relied heavily on admitting students through the pre-degree programme (also called Access or Foundation Programme), O Level (SSCE or General Certificate in Education [GCE]) results and direct entry into year two. At OAU, students were admitted through SSCE combined with National Diploma (ND), National Certificate in Education (NCE), and Institute of Chartered Accountants of Nigeria (ICAN) for direct entry. Applicants were not expected to sit for Unified Tertiary Matriculation Examination (UTME) before admission into both universities, into 100 or 200 level as the case may be. "We don't need to collect any form from Joint Admissions and Matriculation Board (JAMB) again" (OAU IEDS 2). "You don't have to write JAMB exam [i.e., UTME] before you come in" (NOUN OSCAF 1). Modes of admission at NOUN and OAU were similar, though some aspects also differed. O Level results (with a minimum of five credit pass, including Mathematics and English in SSCE or GCE) were the usual basic requirement in both settings and candidates did not need to write the UTME. The SSCE/GCE could be from examinations conducted by the West Africa Examination Council or the National Examination Council. While applicants might gain admission into NOUN only on the merit of their O Level results, applicants interested in OAU usually had higher qualifications such as ND, NCE, or ICAN certificate depending on the courses they intended to pursue.

At OAU's CDL, candidates were admitted into the 100 level for Economics and Accounting programmes on the merits of their O Level results, but admission into any OAU IED programme was always through direct

entry into 200 level (Part 2) with NCE or diploma in education. NOUN too required NCE/ND for direct entry admission. There was a prevailing alternative route to gain admission into NOUN, the Access or Pre-Degree Programme, for prospective undergraduates who had some deficiency in their O Level results. OAU did not have such pre-degree programme for prospective distance learners. It may be that the similarities in the admission processes are because they were both federal universities and/or subject to the same code of conduct and regulations of the NUC.

Instructional Resources

In the single-mode institution, major instructional resources were delivered via print media (both hard and soft copies), audio-visuals (CD, VCD, DVD), and uploads to the school's Website. The dual-mode institution used print media, materials programmed on mobile devices, and uploads to the school's Website. Materials programmed on mobile devices and uploads to the school's Website only applied in the case of OAU online distance learning; the part-time programmes still relied on print media. NOUN made its textbooks available as open access literature on the school Website where they were available for students and other scholars, but some students complained about late delivery and insufficiency of the materials. Print materials were central to academic activities but the study centre was meant to be a platform for various supports rather than for compulsory tutorials. OAU students were provided with print materials, and for CDL students only, audio/audio-visual materials programmed on mobile devices and materials uploaded to the school's Website. However, findings did not confirm Agyeman's (2007) report that NOUN already used videoconferencing for some course delivery. The use of radio and television was very limited and unpopular at NOUN, though these traditional media were supposed to be deployed for its operations.

Materials uploaded on CDL students' tablets and the centre's Website included video of studio-recorded lectures while OAU IED students relied on print media alone, except for those who personally made an effort to get learning resources through other platforms. This limitation is understandable considering that Nigerian society has been largely at the low extreme of the digital divide due to poor socio-economic, technological, and infrastructural developments. As Al-Alawneh (2013) argued, educational strategies should not be isolated from the context. Students and facilitators had issues with uploading or submitting assessments or uploading videos. One NOUN facilitator complained about the shortage of classes for tutorials. However, the two institutions achieved optimal results by combining available technology with the required pedagogy. In the words of two participant, "I think we have adequate technology to provide required distance learning in this Centre" (OAU CDLAF 1) and "if you are not ICT compliant you cannot meet up with the pace at which NOUN is growing" (NOUN OSCAF 1). According to Anderson and Simpson (2012), this ultimately means it was the combination of human, technological, and organisational resources that led to success.

Blended Learning: Platforms and Patterns of Academic Contact

In terms of contact platforms and patterns, blended learning modes (i.e., a combination of physical and online contacts) were observed in both institutions. Blended learning is a methodological approach for "simultaneous combination of *learning, working and living,* and vice versa" (Olatunji, Otefisan, & Ajayi, 2017, p. 449). Ezekoka's (2015) study showed that three models of blended learning—face-to-face driver model, rotation model, and self-blend model—were practised at NOUN. At NOUN, students and facilitators interacted online via email, chat rooms, and discussion forums (e.g., iLearn and other online classrooms)

as well as through face-to-face meetings at distributed classes and centres on weekdays. At OAU, only the CDL students enjoyed institution-arranged blended learning as they interacted among themselves and with facilitators via email, chat rooms, and online classrooms through the centre's learning management system (LMS) as well as physical contacts on selected weekends and holidays. A facilitator at the centre explained that compulsory physical contacts constituted 30% of the total contacts per semester in accordance with the NUC's no-full-online-education policy. Also, online students must attain at least 75% attendance. Pure online education has not yet been allowed in Nigeria.

At OAU, IED students were limited to face-to-face meetings at the school's campus on weekends (including Friday evenings), holidays, and during the long vacation period around July and August when primary and secondary schools were on break. The blended learning modes practised at the two institutions differed in that while NOUN students usually met face-to-face during weekdays, OAU students had such meetings during weekends and holidays. OAU students were older and most had work and family responsibilities; the result was a need for different schedules, compared with their NOUN counterparts. Attendance is compulsory for OAU students but not compulsory at NOUN. One student (NOUN OSCAF 1) stated that "for a two-credit unit course you have eight hour face-to-face contact with your facilitator." Whereas NOUN students are open learners, some younger individuals behave as if they are full-time students in the sense that they voluntarily attend tutorials and group discussions at the study centre as many days of the week as possible. Thus, some students opined that online tutorial activities were only for students who could not afford to come to study centres regularly.

Continuous Assessment and Examination

At NOUN, students had the option to write their examinations, worth about 60% of their total maximum obtainable mark, through both physical and online platforms. They also had some level of flexibility with regards to where and when they wrote examinations. However, at OAU, students in both subsystems were still restricted to writing their examinations in physical classrooms only. As OAU CDLAF 2 explained:

> Quizzes and assignments are supposed to be online. Yes, but because we find it difficult to relate to the students on the LMS. Some use WhatsApp, some use e-mail. So, they submit an assignment by email and sometimes they [facilitators] give them an assignment on WhatsApp and say, "bring it during the face-to-face." Or during the face-to-face, they are given an assignment and they [facilitators] say, "bring it during the examination."

Participants from NOUN explained that students in 100-level and 200-level courses wrote online examinations, while students in subsequent levels wrote pen-and-paper examinations in designated physical classrooms. Moreover, a facilitator (NOUN LSCAF 2) added:

> If I'm a student and I registered here in Lagos and an assignment is taking me to Abuja or any part of the country, I can get a letter from my study centre so that I can be allowed to sit for my examination in another study centre [all sic].

Partnerships and Academic Staffing Patterns

With regards to partnership or affiliation with other institutions or organisations, both institutions had some form of partnerships. As an open university, NOUN relied more on such partnerships because, for instance, its course writers, lecturers, and tutors were mostly outsourced from other universities, colleges, and polytechnics. Distance learners at OAU were taught by the university's lecturers, albeit under a different agreement. NOUN OSCAF 1 disclosed that "we have permanent staff, academic staff on board that take care of learners' needs. We have also facilitators from sister universities all over the country."

Academic staffing patterns at the universities were understandably different; OAU tutors were full-time, in the sense that they were full-time employees of the university but working with its distance learning units on quasi part-time or contract basis, while NOUN had what Omolewa and Adekanmbi (1994) called floating faculty. OAU IEDAF 1 stated that "we make use of the lecturers that teach the same courses at the full-time and they teach the part-time. We don't employ associate lecturers from outside the university. We maintain the standard." For the online programme, as OAU CDLAF 1 explained:

> There are two sets of facilitators. You have the instructors, who are the real lecturers teaching the students face-to-face… . Whereas, you have tutors who reside in the Centre for Distance Learning, providing a kind of support in terms of interaction with the students online.

However, we found that there was no longer a direct link or partnership between OAU's CDL and IED. The IED-CDL partnership was discontinued due to the need to provide affordable (i.e., less expensive) teacher education through distance education after the ban on outreach systems in the country. Table 3 summarises the details of operational structures and processes of distance learning at NOUN and OAU.

Table 3

Summary of Operational Structures at NOUN and OAU

Aspect	NOUN	OAU
Admission screening, payment of fees, course registration	Online application, payment and registration; physical screening; admission every semester	Online application, payment and registration; physical screening; admission every session
Modes of admission into undergraduate programmes	Access/Foundation/Pre-Degree Programme; O Level results; Direct Entry with NCE/ND	O Level results; Direct Entry (with NCE/ND/ICAN)
Major instructional materials/resources	Print media (hard and soft copies); audio-visual materials (CD, DVD, VCD); materials uploaded to the school's Website/portal	Print Media (hard and soft copies); materials programmed on mobile devices (CDL only); materials uploaded on the school's Website (CDL only)

Platforms and patterns of contact	Online/virtual contact via email, chat rooms, phone, and social media; face-to-face meetings at distributed classes/centres on week days; blended learning (physical and virtual/online meetings)	Online/virtual contact via email, chat rooms, phone, and social media; face-to-face meetings at institution's campus (weekends and holidays); blended learning mode (physical and virtual/online meetings; CDL only)
Attendance during a contact	Not compulsory	Compulsory
Modes of examination	Both physical and online platforms; flexible (students can choose where and when)	Physical classrooms
Staffing patterns	Full-time facilitators and part-time facilitators from other institutions	Full-time facilitators and quasi part-time facilitators from the university
Partnership or affiliation with other institutions or organisations	Libraries/resource centres (public or private); other higher institutions; other unit(s) within the institution	Libraries/resource centres (public or private); other higher institutions; other unit(s) within the institution

Conclusion, Implications, and Recommendations

The findings of this study do not provide generalisations about distance learning systems in Nigeria, but the following conclusions provide insights for a deeper understanding of the state of distance learning there. First, single- and dual-mode institutions are both similar and different in terms of their operational structures. Operational structures adopted in any mode of distance education should aim to create a learning process that is active, collaborative, and social. Second, personal, institutional, and situational barriers affect the availability and utilisation of facilities as well as study resources at both institutions. Availability and sufficiency of facilities, in turn, affects the adequacy of the operational structures in the institutions.

Although many differences are observable, NOUN and OAU seem to be evolving towards fulfilling their mandates, especially in the context of their inherent natures as a dedicated distance learning institution and a mixed distance learning institution, respectively. Centralisation of operations and facilities (i.e., Ife-bound) characterises the dual-mode institution; part-time students want ICT to be deployed for blended learning. While the two universities are using blended learning approaches, OAU might have to incorporate this into its part-time studies in IED if it aims to keep pace with providing modern distance education. Meanwhile, any further upgrade of the OAU part-time subsystem would result in unaffordable financial cost implication for the students.

It is recommended that the deployment of ICT for various operational and instructional purposes be sustained in all forms of distance education but with an emphasis on usability, affordability, and ultimately to enhance learners' academic achievements. Dual-mode institutions, in particular, should devise means for utilising blended learning for all subsystems of distance education, including part-time students,

especially to reduce cost and ease the stress of travelling. Both institutions must sustain what is working while they innovatively improve in other aspects. Indeed, virtualization technology has the potential to minimise costs, increase efficiency, and solve challenges of limited physical facilities. Promoting ICT-driven distance education, therefore, will help prospective learners access education irrespective of distance.

References

Abdel-Maksoud, N. F. (2018). When virtual becomes better than real: Investigating the impact of a networking simulation on learning and motivation. *International Journal of Education and Practice, 6*(4), 253-270. https://eric.ed.gov/?id=Ej1210050

Abdulsalam, N., Condrasky, M., Bridges, W., & Havice, P. (2017). The promise of andragogy and experimental learning to improve teaching of nutrition concepts to culinary arts students. *Journal of Food Science Education, 16*(2), 54–61. https://doi.org/10.1111/1541-4329.12107

Adanir, G. A., Ismailova, R., Omuraliev, A., & Muhametjanova, G. (2020). Learners' perception of online exams: A comparative study in Turkey and Kyrgyzstan. *International Review of Research in Open and Distance Learning, 21*(3). https://doi.org/10.19173/irrodl.v21i3.4679

Adebisi, T. A. (2013). Attaining sustainable livelihood and democracy through vocational training and livelihood diversification. *Journal of Nigerian National Council for Adult Education, 19*(1), 63–79. University Press PLC.

Adebisi, T. A. (2018). Training in the production of clan-bond trades in southwestern Nigeria: The non-formal and informal learning approaches. In A. Breedveld & J. Jansen (Eds.), *Education for life in Africa* (pp. 266–285). African Studies Centre.

Adeleke, I., & Adesina, O. (2018). An empirical comparison of the academic performance of students in the distance learning and traditional classroom environment. *Social Science Asia, 4*(1), 26–41. https://www.researchgate.net/publication/325300466

Agyeman, O. T. (2007). *Survey of ICT and education in Africa: Nigeria country report*. ICT for education in Nigeria. *info*Dev. https://www.infodev.org/infodev-files/resource/InfodevDocuments_422.pdf

Ahn, J., & McEachin, A. (2017). Student enrollment patterns and achievement in Ohio's online charter schools. *Educational Researcher, 46*(1), 44–57. https://doi.org/10.3102/0013189X17692999

Ajadi, T. O., Salawu, I. O., & Adeoye, F. A. (2008). E-learning and distance education in Nigeria. *The Turkish Online Journal of Educational Technology, 7*(4), 61–70. https://files.eric.ed.gov/fulltext/EJ1102939.pdf

Akande, O. J., & Sofowora, O. A. (2011). Globalization information and communication technologies (ICTs) and open/distance learning in Nigeria: Trends, issues and solution. *Turkish Online Journal of Distance Education, 12*(3), 66–77. https://eric.ed.gov/?id=EJ965052

Akinwale, A., & Onwuameze, D. (March 5, 2020). Nigeria overtakes South Africa as Africa's largest economy. *This Day*. https://allafrica.com/stories/202003050216.html

Akter, N., & Ali, A. (2016). Analysis of assignments' assessment for distance learners in single vs dual mode institutions. *Bulletin of Education and Research, 38*(2), 15–35. https://files.eric.ed.gov/fulltext/EJ1210304.pdf

Al-Alawneh, M. K. (2013). Examining e-learning barriers as perceived by faculty members of engineering colleges in the Jordanian universities. *International Journal of Vocational and Technical Education, 5*(4), 42–53. https://doi.org/10.5897/IJVTE2013.0121

Anderle, J. S. (2018). *Procedural learning: A comparison of skills acquisition between an online environment and traditional classroom training* (Order No. 10807895) [Doctoral dissertation, University of Wyoming]. ProQuest Dissertations and Theses Global.

Anderson, T., & Cuttler, C. (2020). Open to open? An exploration of textbook preferences and strategies to offset textbook costs for online versus on-campus students. *International Review of Research in Open and Distributed Learning, 21*(1), 40–60. https://doi.org/10.19173/irrodl.v20i5.4141

Anderson, B., & Simpson, M. (2012). History and heritage in distance education. *Journal of Open, Flexible, and Distance Learning, 16*(2), 1-10. https://files.eric.ed.gov/fulltext/EJ1080085.pdf

Baiyewu, L. (2017, June 6). NOUN graduates now eligible for NYSC, Law School. *The Punch*. https://punchng.com/noun-graduates-now-eligible-for-nysc-law-school/

Barrow, D. M. (2017). *A phenomenological study of the lived experiences of parents of young children with autism receiving special education services* (Doctoral dissertation). https://doi.org/10.15760/etd.5919

Biao, I. (2012). Open and distance learning: Achievements and challenges in a developing sub-educational sector in Africa. In P. B. Muyinda (Ed.), *Distance education,* (pp. 27–62). Intech Open.

Bušelić, M. (2012). Distance learning— concepts and contributions. *Oeconomica Jadertina, 2*(1), 23-34. https://doi.org/10.15291/oec.209

Commonwealth of Learning. (2001). *Building capacity to deliver distance education in Nigeria's federal university system* (Report prepared for the World Bank). https://docplayer.net/4801440-Building-capacity-to-deliver-distance-education-in-nigeria-s-federal-university-system-report-prepared-for-the-world-bank.html

Duffy, T., Gilbert, I., Kennedy, D., & Kwong, P. W (2002). Comparing distance education and conventional education: Observations from a comparative study of post-registration nurses. *Research in Learning Technology*, *10*(1). https://doi.org/10.3402/rlt.v10i1.11304

Ezekoka, G. K. (2015). Blended learning in National Open University of Nigeria (NOUN): Prospects and constraints. *International Journal of Innovation and Research in Educational Sciences, 2*(6), 457–461.

https://www.ijires.org/administrator/components/com_jresearch/files/publications/IJIRES_457_Final.pdf

Federal Ministry of Education. (2000). Education today. *Quarterly Journal of the Federal Ministry of Education, 8*(3), 59–64.

Federal Republic of Nigeria. (2004). *National policy on education* (4th ed.). Nigerian Educational Research and Development Council. http://wbgfiles.worldbank.org/documents/hdn/ed/saber/supporting_doc/AFR/Nigeria/TCH/National%20Policy%20on%20Education.pdf

Federal Republic of Nigeria. (2013). *National policy on education* (6th ed.). Nigerian Educational Research and Development Council. https://educatetolead.files.wordpress.com/2016/02/national-education-policy2013.pdf

Gaskell, A., & Mills, R. (2015). The quality and reputation of open, distance and e-learning: What are the challenges? *Open Learning: The Journal of Open, Distance and e-Learning, 29*(3), 190–205. https://doi.org/10.1080/02680513.2014.993603

Ikegulu, B., & Oranusi, S. (2014). Distance and open learning in Nigeria: Progress, concerns and prospects. *Journal of Education and Practice, 5*(35), 167–171. https://core.ac.uk/download/pdf/234636688.pdf

Keegan, D. (1990). *Foundations of distance education* (2nd ed.) Routledge.

Keegan, D. (1996). *Foundations of distance education* (3rd ed.) Routledge.

López Soblechero, M. V., González Gaya, C., & Hernández Ramírez, J. J. (2014). A comparative study of classroom and online distance modes of official vocational education and training. *PLoS ONE 9*(5), e96052. https://doi.org/10.1371/journal.pone.0096052

Naido, P. (March 5, 2020). Nigeria tops South Africa as the continent's biggest economy. *Bloomberg*. https://www.bloombergquint.com/business/nigeria-now-tops-south-africa-as-the-continent-s-biggest-economy

Obioha, M. F., & Ndidi, U. B. (2011). Administrative problems of open distance education in Nigeria. A case study of National Open University of Nigeria. *Journal of Educational and Social Research*, *1*(5), 89–97. https://www.richtmann.org/journal/index.php/jesr/article/view/11766/11372

Okonkwo, C. A. (2012). Assessment of challenges in developing self-instructional course materials at the National Open University of Nigeria. The *International Review of Research in Open and Distributed Learning, 13*(2), 221–231. https://doi.org/10.19173/irrodl.v13i2.930

Olakulehin, F. K., & Panda, S. K. (2011). Private cost of education: A comparative study of distance and campus-based university students in Nigeria. *European Journal of Open, Distance and E-Learning,* (2), 1–12. https://files.eric.ed.gov/fulltext/EJ954910.pdf

Olatunji, T. I., Otefisan, M. A., & Ajayi, F. O. (2017). Promoting adult education and lifelong learning in contemporary Nigeria through blended learning. *Adult Education in Nigeria, 22*(1), pp. 448-461. Ambik Press.

Omolewa, M., & Adekanmbi, G. (Eds.). (1994). *University initiatives in adult education*. Ibadan University Press.

Onwe, O. J. (2013). Policies and practice of open and distance learning models in the sub-Saharan African countries: A literature survey. *American International Journal of Contemporary Research, 3*(8), 122–135. https://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.1086.5371&rep=rep1&type=pdf

Oyeleke, O., & Apena, T. T. (2018). Stakeholders' perception on some selected critical issues in open and distance education in Nigeria. *Journal of Educational Foundations and Development, 7,* 234–243. https://www.researchgate.net/publication/344197747_JOURNAL_OF_EDUCATIONAL_FOUNDATIONS_AND_DEVELOPMENT_2018_VOLUME_07

Paul, J., & Jefferson, F. (2019). A comparative analysis of student performance in an online vs. face-to-face environmental science course from 2009 to 2016. *Frontiers in Computer Science. 1*(7). https://doi.org/10.3389/fcomp.2019.00007

Terwase, I. T., Abdul-Talib, A., & Zengeni K. T., (2014). Nigeria, Africa's largest economy: International business perspective. *International Journal of Management Sciences, 3*(7), 534–543. https://ideas.repec.org/a/rss/jnljms/v3i7p8.html

Trindade, A. R., Carmo, H., & Bidarra, J. (2000). Current developments and best practice in open and distance learning. *International Review of Research in Open and Distributed Learning, 1*(1), 1–25. https://doi.org/10.19173/irrodl.v1i1.7

Tucker, S. (2001). Distance education: Better, worse, or as good as traditional education? *Online Journal of Distance Learning Administration, 4*(4). https://www.westga.edu/~distance/ojdla/winter44/tucker44.html

Yin, R. (2003). *Application of case study research*. Sage.

Zormanová, L. (2016). The comparison of distance learning between the Czech Republic and other European countries. *International Journal of Research in E-learning, 2*(1), 88–103. https://www.researchgate.net/publication/335993205_The_Comparison_of_Distance_Learning_Between_the_Czech_Republic_and_Other_European_Countries


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Using Open Educational Resources at Viterbo University: Faculty and Student Feedback

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Abstract

This study evaluated a coordinated and collaborative pilot implementation of open educational resources (OER) across multiple disciplines including nursing, accounting, environmental science, religious studies, and finance. Participating faculty were qualitatively surveyed regarding their experience creating and implementing OER in a course. Students were surveyed on their perceptions of OER quality, cost savings, and ease of use. Faculty had an overall positive experience with OER, believing there was a significant benefit to students in cost savings while maintaining learning quality. Faculty felt the OER implementation process took a significant investment of time and recommended that faculty should be compensated for creating and implementing OER materials in future courses. Students overall showed positive responses to using OER in their course; the majority of students agreed with the OER cost savings, quality of OER resources, ease of using OER, and they trusted the use of OER materials. Older students (over 30 years) were more likely to state they would print out OER materials rather than read them online (as compared with students 30 and under). Senior-level students agreed significantly more than did freshman-level students that OER presented a cost savings. Faculty recommendations from this study included focusing on courses with very high textbook costs and courses that would impact the greatest number of students. Additionally, faculty recommended a follow-up revision process to keep OER materials current after implementation.

Keywords: open educational resources, OER, open textbooks, textbook cost savings, free textbooks

Introduction

According to Kristof (2018), the average cost of college textbooks has risen in the last 10 years at a pace four times faster than the rate of inflation, and the national average cost of textbooks per student is over $1,200 per academic year. In addition, 65% of students admitted they had skipped purchasing a required textbook at some point because they could not afford it (Kristof).

The use of open educational resources (OER) is one potential solution to the high and rising cost of college textbooks. Open educational resources are educational materials (typically electronic) available for little or no cost including textbooks, course readings, and other learning content such as simulations, games, syllabi, quizzes, and assessment tools. These materials are generally released under a Creative Commons or similar license that supports open or nearly open use of the content (Atkins et al., 2007). The William and Flora Hewlett Foundation (2021) provides the following similar definition of OER:

> At Hewlett, we use the term "open education" to encompass the myriad of learning resources, teaching practices and education policies that use the flexibility of OER to provide learners with high quality educational experiences. Creative Commons defines OER as teaching, learning, and research materials that are either (a) in the public domain or (b) licensed in a manner that provides everyone with free and perpetual permission to engage in the 5R activities– retaining, remixing, revising, reusing and redistributing the resources. (para. 4)

It is important to recognize that the licensing varies depending on the resource. Not all resources can be adapted or modified, and not all can be redistributed with or without modifications. Some OER require that if the content is utilized or redistributed, any images or text must contain sourcing acknowledgements, which may include live links to the original sources. Perhaps one of the most complex aspects of using OER to teach a course is having a good understanding of what is allowable—from a licensing standpoint—for the particular content an instructor might choose to use.

Textbooks have traditionally been the means for delivering content to students in higher education, and most faculty believe their students learn better when they have read their assigned textbook readings before coming to class (Hilton, 2016). However, due to the high price of textbooks, and faculty who are conscious of how much their students spend on them (as well as a general awareness that if textbooks are unaffordable, students will do without them), some instructors are substituting OER for books (Hilton, 2019).

There are many good arguments for using OER in place of expensive textbooks. According to Schaffhauser (2014), the following benefits can be experienced by students and faculty when courses utilize OER:

- All course materials are immediately accessible to students, so there is no reason to do without the materials as students sometimes do when they cannot afford the textbook.
- The savings experienced by students can be significant.

- Students are more likely to enroll in courses that use OER over courses that use a textbook.
- Faculty do not need to make multiple changes to the content as they do when a textbook has a new edition available.

OER may also be beneficial to international students. Delgado et al. (2019, p. 200) found that international students were positively impacted by the use of OER, potentially because some of the content included subtitled videos, allowing them to view the material repeatedly.

Many faculty have reservations and face obstacles in adopting OER instead of a textbook. One study found that although more professors know about free textbook options and agree that the cost to students is important to them, only a very small percentage have adopted them for use in their classes (Blumenstyk, 2016b). The barriers perceived by faculty include finding enough resources in the subject they teach, lacking a catalog of potential resources they could use (Blumenstyk, 2016b), and lacking the time to collect the materials, vet them, and design the course around them (Blumenstyk, 2016a).

The literature around OER has focused on two main questions (Hilton, 2016). The first question relates to whether students can achieve the learning outcomes at the same level using OER rather than textbooks. The second question is whether the students and instructors perceive the OER to be of high quality. Hilton's (2016) study found that students generally achieve the same learning outcomes using OER as they would have achieved with the textbook, while also experiencing significant cost savings. Hilton also found that both student and faculty perceptions of OER were generally positive. They believed that OER are of comparable quality to more traditional textbooks.

At Viterbo University, although many faculty are aware of the cost savings for students when using OER, there has not been a large shift away from textbooks. Faculty resistance to adopting OER rather than traditional textbooks may center on a few important factors, including the time it takes to find the resources and design the course around them.

For many faculty, a shift to using OER instead of textbooks without significant support from their university has not been feasible. In order to explore what it takes to convert course content to OER, a group of faculty members at Viterbo University began a pilot program where six faculty members, an electronic resource librarian, and an instructional designer worked to move course content from textbooks to OER content in five courses. The university administration provided support for this project through an institutional grant and maintained a strong interest in the findings. With the growing number of student evaluation comments regarding the cost of education and high costs of purchasing required textbooks, university administration considered causes and impact of financial hardship on student progression and retention.

The faculty group working on this project began meeting in April, 2017. They continued to meet on a regular basis throughout the 2017–2018 academic year to compare notes as they gathered and vetted OER materials, designed their courses, and taught their courses. In this case study, the faculty-led pilot group at Viterbo University compiled common themes from their curricular design process notes. In addition, the

pilot group gathered feedback from the students enrolled in five courses regarding their perceptions of the value and quality of the materials as well as their perceptions of their own learning using OER.

Early in the process, the pilot group members questioned what could be done to support the faculty as they converted their courses to utilize OER content. According to the pilot study group and recent literature, deans, presidents, and academic administrators can focus on supporting those faculty who decide to use OER. This support could come in several different forms, including the following:

- instructional design team members who can help the faculty create course content using OER;
- library staff who can help faculty curate OER content;
- philanthropic attention to support projects that build an open collection in a given discipline (Blumenstyk, 2016a);
- public recognition of the faculty who are leading the way in creating courses using OER (Blumenstyk, 2016a); and
- giving faculty who have converted a course to OER the opportunity to share their work with faculty who do not have experience with OER.

Many of these supports were put in place in this pilot program at Viterbo University, including (a) institutional funding for participating faculty, (b) support of an instructional designer and an electronic resources librarian, (c) an opportunity for participants to share their work with other faculty, and (d) public recognition of the members of the pilot group. The objectives of the study included:

- Evaluating the student experience of using newly designed OER materials across five disciplines through their perceptions of cost, quality, and ease of use.
- Evaluating the faculty perceptions related to their experience of finding, creating, and implementing OER materials across five disciplines.

Research Method

Several research questions were under investigation in this study, based on the two groups that were included. The first group included the faculty who were participating in the pilot project. The pilot faculty group was gathered, and meeting notes were documented and organized around frequently-noted topics. By learning about and documenting their experiences in gathering and vetting the OER materials and designing their courses around those materials, the investigators were better able to understand how to help faculty navigate this process more effectively and efficiently in the future.

The second group under investigation in this study was the group of students enrolled in the courses using OER. The intent was to investigate student perceptions of OER materials related to cost savings, ease to access, preference of printed versus electronic versions, level of trust and quality of information, and impact on their learning (see Figure 1 for details).

The questions were formatted as five-point Likert items in a student survey using Qualtrics; students were asked to identify their level of agreement (or disagreement) with each statement. Students were asked to respond to nine statements, where 1 = *strongly disagree*, 2 = *disagree*, 3 = *neither agree nor disagree*, 4 = *agree*, and 5 = *strongly agree*.

Student participants were recruited by sending an explanatory electronic letter out to all students who were enrolled in a course that was part of the OER project. The letter was sent via e-mail from each instructor to their entire roster for the course and included a link to a Qualtrics survey. Upon opening the survey link, respondents received instructions for completing the survey, an assurance that the respondents would not be identifiable to the researchers, an option to opt out of the survey, and a statement regarding the protection of the confidentiality of their responses (Note: Viterbo's Institutional Review Board (IRB) granted an exclusion from IRB review, as this project was characterized as quality improvement.). The respondents were asked to reply to the survey within one week. A second reminder e-mail was sent four days after the first message, and it included the cover letter information and the survey link again, along with a reminder to reply by the established deadline. The survey settings only allowed one response per IP address, to prevent multiple responses from the same individual.

In the survey, students were asked to identify themselves in the following demographic groups: (a) age; (b) gender; (c) student type (returning adult student or traditional undergraduate student); (d) year (freshman, sophomore, junior, or senior); and (e) their status as a full-time or part-time student. From the list of five courses in the pilot project, students were also asked to identify which course they were taking in OER format, and whether the format was online or in the classroom. Using each of these grouping variables to make comparisons in responses, several statistically significant differences were identified in the survey data.

Statistical analyses were conducted with SPSS statistical analysis software (version 24). Due to the non-parametric nature of the five-point Likert items, a series of Mann-Whitney U and Kruskal-Wallis tests were run using SPSS statistics analysis software (version 27; Ranganathan et al., 2016). As three of the grouping variables, including age, returning adult student versus traditional student status, and full-time versus part-time status were likely to have overlap or may be subsets of each other, Bonferroni-corrected *p*-values for tests with these groups were reported in the analysis.

Analysis of Research

Faculty Experience

Participating faculty discussed the challenge of finding and vetting course content. Some faculty reported difficulty with finding OER content in their discipline, particularly up-to-date content. Others reported finding so much content that it was difficult to narrow down what they wanted to use. For some, the challenge was in finding a single source, so they selected content from multiple sources and had to do the work of weaving it together in a way that created a logical sequencing of content and a positive, meaningful learning experience for the students.

Faculty also experienced a steep learning curve in their first attempts to select OER content and use it to create a pedagogically sound course. Although they received assistance with curating content from the electronic resource librarian, and assistance with course design from the instructional designer, there was a wide range of preparation time to prepare for a three-credit course. Preparation ranged from 50 to 120 hours of faculty time, plus 10 to 25 hours of the electronic resource librarian's time, and additional time from the instructional designer. In all cases, faculty indicated this was in excess of the time they would normally spend on preparation for the particular courses within which the OER content was being added, similar to findings by other universities using OER (McGreal, 2019). Had textbooks been used, the electronic resource librarian's time would have been zero hours for any of these given courses. Instructional design time was also in excess of normal time spent assisting faculty with content flow, activity development, and formatting.

At times, the OER content did not transition well from one topic to the next, especially when faculty were working with multiple resources to cover all the desired content for the course. When multiple resources were utilized, there was a related increase in the amount of time it took to prepare the materials for the course. Similar to the experiences at other universities (Dennen & Bagdy, 2019; Dudek et al., 2019; McGreal, 2019), faculty spent time authoring transitional content, developing practice problem sets and case studies, and writing quiz or exam questions and answer keys, as these are typically included in the instructor resources from many commercial textbook publishers. They also spent time preparing tutorial videos that would demonstrate problem or case study solutions.

In some instances, faculty were able to select a single electronic textbook, and the university purchased a multiple-user license to share the text with all students in the course. This practice steeply reduced the amount of time faculty spent on designing the course, but also resulted in a few challenges. Students in the courses sometimes had technical issues that would not occur with a paper textbook, including that the electronic text would freeze while they were using it. Faculty reported that some students had difficulty navigating the electronic text, and difficulty printing out materials if they desired to do so, while these would not be issues if they were utilizing a hard copy textbook.

In the months following the initial offering of the five courses in the pilot project, faculty acknowledged that the courses needed some additional development. Improvements to the content were needed each time the

courses were offered. This consumed additional preparation time for faculty, as well as some additional time with the electronic resource librarian and the instructional designer, but it was necessary to address any issues with the content that arose as it was being utilized in the course.

Despite several difficulties, faculty who participated in the pilot study were pleased with the result, and excited to be able to teach from the OER content on a regular basis. Faculty who had taught their courses multiple times reported that subsequent offerings improved the quality of the course, but also allowed the instructor to focus on the students and meeting their learning needs, with less time spent on preparation of course materials. Perhaps there will be some time savings in subsequent semesters due to the faculty being very familiar with the content, having written some of the practice sets and case studies, and having recorded video tutorials.

Overall, faculty who participated in the pilot project at Viterbo University believed there was great potential for OER if resources can be made available to assist faculty with the workload to create a good course and a good learning experience for students.

Cost Savings for Students

One of the intended outcomes of the pilot project at Viterbo University was to reduce the cost of course materials for the students. To that end, the textbook costs that would be eliminated by switching to OER content were identified for each course. This savings amount was applied to the average number of students per section, and then multiplied by the number of sections typically running in one year. Table 1 demonstrates the total savings per year for each course, as well as the total annual savings for all five of the piloted courses. Total savings per student per course was approximately $160.

Table 1

Cost Savings by Course

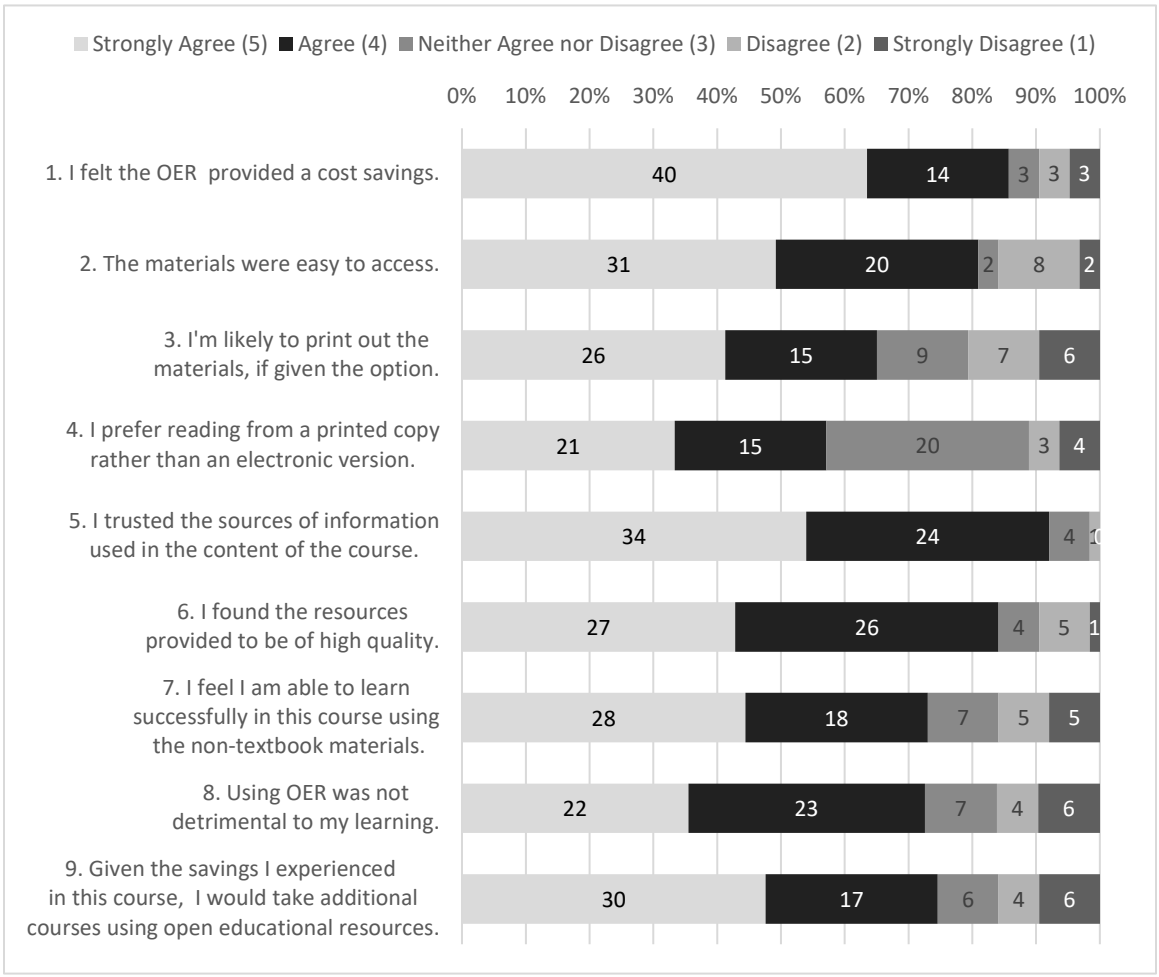
Course	Textbook cost savings per student	Students per section	Sections per year	Students per year	Savings per year
OMGT 318 (online)	$240.00	15	3	45	$10,800.00
OMGT 308 (online)	$266.00	15	3	45	$11,970.00
ENVS 101 (online)	$115.00	22	3	66	$7,590.00
ENVS 101 (F2F)	$146.00	20	2	40	$5,840.00
RLST 305 (online, **b**lended, F2F)	$94.00	22	5	110	$10,340.00
NURS 290 (F2F)	$173.00	200	1	200	$34,600.00
Total	$1,034.00	294	17	506	$81,140.00

Student Survey Results

Figure 1 provides the students' responses to nine statements. It is clear from the results that the majority of respondents felt the OER materials did provide a cost savings (85.71% responded *agree* or *strongly agree*), and the materials were easy to access (80.96% responded *agree* or *strongly agree*). Also, 92.07% of the respondents said they trusted the sources of information used in the content of the course, by indicating they agreed or strongly agreed with that statement. And 84.13% of the respondents agreed or strongly agreed that the resources provided were of high quality. Lower levels of agreement, yet still representing a strong majority, indicated respondents felt they were able to learn successfully using the non-textbook materials (73.01% *agree* or *strongly agree*), using OER was not detrimental to their learning (72.58% *agree* or *strongly agree*), and if they had the opportunity, they would take a class using OER again (74.6% *agree* or *strongly agree*).

Figure 1

Student Perception Survey Results



Statements 3 and 4 represented the greatest level of variation in responses. Among the respondents, 65.08% indicated they agreed or strongly agreed that they were likely to print out the materials if given the option; 57.14% agreed or strongly agreed that they preferred reading from a printed copy rather than an electronic version.

In statement 3, the 30 years and under age group (n = 32) was significantly less likely to print out the materials if given the option compared with the over 30 age group (n = 30; Mann-Whitney U: Z = -3.331, Bonferroni corrected ρ = 0.003). Other similar demographics had the same result. Returning adult students (n = 33) more strongly agreed they would be likely to print out the materials than did traditional students (n = 30; Mann-Whitney U: Z = -2.710, Bonferroni corrected ρ = 0.021), and part-time students (n = 22) more strongly agreed they would be likely to print out the materials than did full-time students (n = 41; Mann-Whitney U: Z = -3.436, Bonferroni corrected ρ = 0.003). General qualitative feedback from students across courses showed that some students preferred studying from a textbook for tests and quizzes. Returning adult students are generally older, and more likely to be part-time students, so providing an option to print out OER materials is important. In statement 5, females more strongly agreed that they trusted the sources of information used in the content of the course than did males (Mann-Whitney U: Z = -2.400, ρ = 0.016). This could be a difference in opinion based on gender, or it could be related to the fact that the majority of students who took the survey were female (48 females vs. 15 males).

When respondents were categorized by year, the seniors (n = 18) more strongly agreed that the OER materials presented a cost savings, when compared with freshmen (n = 4), sophomores (n = 26), and juniors (n = 14; Kruskal-Wallis: $\chi 2$ = 8.295, ρ = 0.040, df = 3).

The data for each course suggest students in all courses agreed on most issues. However, in some cases, students significantly disagreed regarding their perceptions on the ease of access to course materials. Students in OMGT 318 (*Managerial Finance*) strongly agreed with the statement that the materials were easy to access, while students in RLST 305 (*Theology*) disagreed with this statement (Kruskal-Wallis: $\chi 2$ = 11.057, ρ = 0.026, df = 4). These two courses were delivered in different ways. The content of OMGT 318 was placed in learning modules that students accessed via the LMS. In addition, the content was also placed into PDF files that could be printed if students chose to do so. In RLST 305, students accessed course materials via an online electronic textbook purchased with a university-wide license. In order to access the online text, students were routed to the library Website via a Web browser. Some students indicated that the text in the Web browser froze as they were using it, resulting in their being unable to navigate through the course material. The distinction between the way the content was delivered in these two courses likely accounts for the significant differences in students' perceptions regarding ease of access.

Faculty Participant Recommendations

Participating faculty experienced a learning curve when selecting content and developing the course site on the LMS, where the OER content was accessible. Students experienced a learning curve as well. It took them some time to understand the options available to them (such as printing the materials or accessing the multi-user e-book). Once students understood a process for accessing the content, they appreciated the cost

savings; a majority felt it was worth the experience, and they would take another course using OER content, if given the opportunity.

When reflecting upon their experience creating courses using OER content, participating faculty recognized that not all classes are appropriate for OER content. They found that sometimes the quality of illustrations and the value of the simulation-type exercises provided by book publishers is not currently available in OER content. Other courses might lack available OER content because what is available as OER is not current, or it does not reflect the best evidence/research as required by practice standards (e.g., tax code changes in an accounting course, national accreditation standards for a nursing class).

Faculty involved in the pilot study suggested that if a university decides to take on a similar initiative to convert courses to using OER content rather than textbooks, a proposal process should be implemented. This way interested faculty can investigate, with the help of an electronic resource librarian, what materials are available and understand how they can be used according to the licensing requirements, as well as the amount of work that will be involved in implementing OER for the specific course.

In addition to a proposal process, faculty in the pilot study recommended a compensation plan for faculty who develop courses utilizing OER content. This is necessary because of the potentially extensive amount of time involved in reviewing content, authoring transitional content, creating practice problem sets or case studies, and recording videos. The compensation could be paid with the understanding that the university owns the content and course design going forward, so it could potentially be utilized by other instructors in the future, including adjunct faculty.

It is important for the development of OER content to focus on where there can be the most impact on students—through both cost savings and improved learning. Faculty noted that not all courses are good candidates for using OER content instead of a commercial textbook. Careful consideration should be given to the types of courses that make good candidates for this type of transition. This may include the following:

- Introductory courses with a single source or well-developed OER content available for use, with more robust support materials to reduce the need for faculty to author transitional content, practice sets, case studies, and videos.

- Courses offered in a format that is highly interactive, with content and course design supporting strong interaction between faculty and students, including using various media to satisfy the varied learning preferences of students.

- Courses where textbooks are costly, and where OER content is easily accessible.

In addition to the types of classes that would lend themselves to the use of OER, some important considerations must be given to whether the materials used can be printed easily. Some OER are difficult to print by nature of how they are published, such as Web pages versus PDF documents that are available for download.

Finally, faculty who participated in the pilot project recommended that a follow-up process be built into the requirements of the proposal to convert courses to OER. This should include a policy for reviewing and updating the content on a regular basis. OER should also be made available to students and instructors in future sections of the course, so that the institution will benefit over the long term from the investment in course development work.

Conclusions

Several conclusions can be drawn from the student perception survey data. First, when implementing OER materials, the student population that is likely to take a particular course needs to be considered. Older, returning, and part-time students prefer to have a printed copy of their materials, so careful consideration of the format that will be perceived to be the most comfortable and accessible for the predicted student population is necessary. In addition, consideration should be given to how the materials are presented within the learning management system or using links to electronic resources, to make sure access is readily available and functioning well. Students will be most satisfied if they are able to easily access and navigate the course materials.

This project was a collaborative effort to design courses around open educational resource content. It was an opportunity for faculty and administration to understand the time commitment of this kind of development work, and the challenges related to gathering and connecting information from a number of different sources. Faculty discovered that partnering with an electronic resource librarian and an instructional designer were critical steps in successfully gathering content and making it available to students in a structured way. Faculty participants also had a positive experience with OER, resulting in the belief that although the course design work required a large time commitment, students significantly benefitted via cost savings, while also maintaining the quality of the learning experience. Student responses echoed this observation, with the majority agreeing that they experienced significant cost savings, while the quality of these materials met their expectations.

References

Atkins, D. E., Brown, J. S., & Hammond, A. L. (2007, February). *A review of the open educational resources (OER) movement: Achievements, challenges, and new opportunities* [Report to the William and Flora Hewlett Foundation]. https://pdfs.semanticscholar.org/8d16/858268c5c15496aac6c880f9f50afd9640b2.pdf

Blumenstyk, G. (2016a, July 12). As free textbooks go mainstream, advocate says colleges should do more to support them. *The Chronicle of Higher Education*. https://www.chronicle.com/article/As-Free-Textbooks-Go/237082

Blumenstyk, G. (2016b, July 26). More professors know about free textbook options, but adoption remains low. *The Chronicle of Higher Education*. https://www.chronicle.com/article/More-Professors-Know-About/237252

Delgado, H., Delgado, M., & Hilton, H. (2019). On the efficacy of open educational resources: Parametric and nonparametric analyses of a university calculus class. *International Review of Research in Open and Distributed Learning, 20*(1). https://doi.org/10.19173/irrodl.v20i1.3892

Dennen, V.P., & Bagdy, L.M. (2019). From proprietary textbook to custom OER solution: Using learner feedback to guide design and development. *Online Learning, 23*(3), 4–20. https://doi:10.24059/olj.v23i3.2068

Dudek, B., Duran, D., & Parscal, T. (2019). Wide open voices: Experiences of OER course developers. *Online Journal of Distance Learning Administration, 22*(2). https://www.westga.edu/~distance/ojdla/summer222/dudek_duran_parscal222.html

Hilton, J. (2016). Open educational resources and college textbook choices: A review of research on efficacy and perceptions. *Education Technology Research and Development, 64*(4), 573–590. https://doi.org/10.1007/s11423-016-9434-9

Hilton, J. (2019). Open educational resources, student efficacy, and user perceptions: A synthesis of research published between 2015 and 2018. *Education Technology Research and Development, 68*, 853–876. https://doi.org/10.1007/s11423-019-09700-4

Kristof, K. (2018, January 26). What's behind the soaring cost of college textbooks? *MoneyWatch*. https://www.cbsnews.com/news/whats-behind-the-soaring-cost-of-college-textbooks/

McGreal, R. (2019). A survey of OER implementations in 13 higher education institutions. *The International Review of Research in Open and Distributed Learning, 20*(5), 141–145. https://doi.org/10.19173/irrodl.v20i5.4577

Ranganathan, P., Pramesh, C. S., & Buyse, M. (2016). Common pitfalls in statistical analysis: The perils of multiple testing. *Perspectives in Clinical Research, 7*(2), 106–107. https://doi.org/10.4103/2229-3485.179436

Schaffhauser, D. (2014, August 27). Complete guide to open educational resources. *Campus Technology*. https://campustechnology.com/articles/2014/08/27/complete-guide-to-open-educational-resources.aspx

William and Flora Hewlett Foundation. (2021). Open education. https://hewlett.org/strategy/open-education/

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The Impact of Demographic Characteristics on Academic Performance: Face-to-Face Learning Versus Distance Learning Implemented to Prevent the Spread of COVID-19

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Abstract

The spread of COVID-19 presents an opportunity for many educational institutions to implement distance learning and ensure the provision of educational resources and services, secure income and revenues, and contribute to the control and prevention of the coronavirus. This study was conducted to investigate the impact of demographic characteristics on academic performance. Students' grades and grade point averages (GPA) were collected from the Admission and Registration Unit, Al Ain University in Al Ain, United Arab Emirates. The data were used to measure academic performance in face-to-face (F2F) learning and distance learning (DL) implemented by the university to prevent the spread of COVID-19. Statistical analysis including the Mann-Whitney test, Spearman's rho test, and a regression test were used to answer research questions and verify hypotheses. Students demonstrated better academic performance in DL than F2F learning. It was found that the number of weak students in F2F learning dropped sharply by more than 11% in DL. Demographic characteristics demonstrated a significant impact on students' academic performance and predicted at least 7.4% variation in F2F learning and DL. Findings of the study support the model developed by Tinto (1975) which proposed the impact of student's attributes, experiences, and family backgrounds on academic performance. The findings suggest non-DL institutions should continue offering DL side-by-side with F2F learning programs.

Keywords: demographic characteristics, academic performance, face-to-face learning, distance learning, coronavirus, COVID-19

Introduction

Educational institutions can be categorized as distance learning (DL), blended learning, or traditional or face-to-face (F2F) learning institutions. At DL institutions, learning takes place without physical presence (Cheawjindakarn et al., 2012), while blended or hybrid learning institutions combine traditional classroom teaching with educational technologies (Kamalluarifin et al., 2018). Traditional learning institutions rely on learning activities and instruction in the classroom without the use of online learning and instructions (Elfaki et al., 2019).

Regardless of the types of educational institutions, the spread of COVID-19 is presenting opportunities and challenges for all types of academic institutions. For DL institutions, the business is as usual, with more opportunities and limited challenges. For blended learning institutions, the pandemic is an opportunity to improve DL tools and equipment, facilities and infrastructures, marketing strategies, and planning. However, for traditional learning institutions, the implementation of DL has been very challenging.

Like many other Gulf countries, the United Arab Emirates (UAE) decided from the beginning of the pandemic to implement DL as an alternative to traditional teaching. The decision was taken in the first week of March 2020 and required all educational institutions to close for four weeks, make necessary arrangements, and complete the academic year through DL. Accordingly, schools and higher academic institutions started delivering courses through DL in the last week of March 2020 (United Arab Emirates, The Ministry of Education, 2020; United Arab Emirates' Government Portal, 2020). It is interesting to note that although Hamdan Bin Mohammed Smart University was the first accredited DL institution in the UAE, other academic institutions have been fully or partially implementing DL since before the spread of the coronavirus, including Al Ain University (Ati & Guessoum, 2010; Lavine & Croome, 2018).

Al Ain University (AAU) is licensed as F2F high education institution in UAE despite using many platforms and tools required for DL before the COVID-19 pandemic. These include Edu-Gate, Moodle, MS Teams, online registration, and a digital library. In fact, before the coronavirus outbreak, the university had been conducting online examinations for some courses every semester according to the examination timetables posted by the Admission and Registration Unit. The availability of these tools, services, and experiences is the key success factor in implementing DL for the first time in all courses offered during the second semester of the academic year 2019-2020.

Irrespective of learning styles and types of educational institutions, students' academic performance can be influenced by a variety of factors such as demographic characteristics, learning environment, employment, and income. Prior studies have compared F2F learning to DL and explored the impact of demographic characteristics on academic performance (Zhao & Abuizam, 2015; Alghamdi et al., 2020). However, these studies were conducted before the spread of COVID-19 and mostly in Western countries (Bernard et al., 2004; Shachar & Neumann, 2010; Nortvig et al., 2018).

This study is an attempt to determine the impact of demographic characteristics on academic performance. According to Tinto (1975), demographic characteristics such as gender, level of study, and specialization play an important role in determining students' academic performance, and this has been proven by many empirical studies (Ortega-Maldonado et al., 2017; Brubacher & Silinda, 2019). This study also compares

academic performance in F2F learning with DL implemented for the first time by AAU to prevent the spread of COVID-19. It is the first study comparing F2F learning to DL at AAU. The results may be useful in understanding the impact of gender, college, and status of students on academic performance, and may be important in dealing with factors affecting academic performance. The study contributes to understanding F2F learning and DL in the Arab world as well as the impact of COVID-19 on academic institutions.

Review of Related Studies

A review of research on students' academic performance in F2F learning and DL shows mixed results. In some studies, F2F outperformed DL (Ferguson & Tryjankowski, 2009; Christmann, 2017), while in others, DL outperformed F2F (Duffy et al., 2002; Elfaki et al., 2019). Additionally, there are studies that report no significant difference in students' academic performance in DL as compared to F2F learning (Jahng et al., 2007; Smith, 2013; Paul & Jefferson, 2019).

Bernard et al. (2004) conducted a comprehensive meta-analysis of literature, reviewing 232 empirical studies related to DL and F2F learning. The authors identified the significant impacts of teaching methodology, pedagogy, and media on students' academic performance in both F2F learning and DL. Students' academic performances were better when efficient delivery or cost was a reason for offering DL. Similar results were reported for students specializing in military and business studies. However, no differences were found between undergraduate and postsecondary education. Nevertheless, graduate schools demonstrated significant results in favor of DL as compared to F2F learning.

In another comprehensive meta-analysis, Shachar and Neumann (2010) reviewed 125 studies published over twenty years (1990-2009) to identify differences in the academic performance of students in DL and F2F learning. The findings of their study indicate a significant difference in the final grades of students enrolled in DL and F2F learning. Besides, the authors identified changes observed across time and directional patterns. The ratio of positive effect sizes across time improved steadily from 63% up to 84%. According to them, students' academic performance in DL was not only comparable to F2F learning but even outperformed it.

In a recent review study, Nortvig et al. (2018) identified factors affecting students' academic performance in DL and blended learning. The dominant factors included the presence of an instructor, interactions, content, and connections between online and offline as well as practice-related activities. The three comprehensive review studies discussed above show that the literature comparing students' academic performance in F2F learning and DL is extensive.

As pointed out by Ismail et al. (2018), students' characteristics including gender, age, status, and ethnicity are among the most significant factors influencing academic performance (Urtel, 2008; Tamim et al., 2011). In the United States, Urtel (2008) explored differences in student academic performance in F2F and DL. The author used grades of 385 students as an indicator of academic performance. The findings revealed a significant difference in academic performance connected to gender, student status, and ethnicity. To be

more specific, female students in F2F learning outperformed female students in DL, but freshmen students of all genders underperformed when compared to other students.

In a separate study, Christmann (2017) compared the academic performance of students enrolled in a statistics course that was offered through DL and F2F learning. Results of the study found that female students in DL outperformed male students, while male students in the F2F learning section scored higher than females. In examining the role of gender and student performance in DL and F2F learning classes, Amparo et al. (2018) used GPA indicators to explore gender differences. Findings of that study showed that female students outperformed male students in F2F classes, while male students and female students demonstrated equal performance in DL.

Similar studies have reported the impact of individual motivation, learning strategies, and cognitive ability on academic performance (Logan et al., 2017; Stark, 2019). Likewise, others have explored differences and similarities between F2F learning and DL with respect to demographic characteristics, satisfaction, competences, learning outcomes, and academic performance (Ortega-Maldonado et al., 2017; Brubacher & Silinda, 2019). An interesting investigation by Fadda (2019) identified goal orientation, self-efficacy, time and study environment management, seeking assistance, and Internet self-efficacy as self-regulatory attributes that predict academic performance.

The review of literature shows sufficient studies that have investigated academic performance in F2F learning and DL. Prior studies have explored students' differences in F2F learning and DL as well as other factors affecting academic performance. The factors included demographic characteristics, attitude and perception, competencies, and skills. The current study reports students' academic performance in F2F learning and DL implemented to prevent the spread of the coronavirus. Findings of this study should contribute to the understanding of the impact of COVID-19 on students' academic performance.

Conceptual Background

Demographic Characteristics

Demographic characteristics refer to attributes that describe the status of people or a person such as age, gender, ethnicity, or income. This study used gender, college, and status of students as demographic characteristics. Gender denotes biological differences in being male or female. College in this study refers to the schools or faculty of AAU. It consists of two groups: (a) English-based instruction colleges, which include engineering, pharmacy, and business, and (b) Arabic-based instruction colleges, which include law, education, and communication. Status refers to whether a student is a junior or a senior. We consider first- and second-year students as junior, while third-, fourth-, and fifth-year students are considered senior. Prior studies have suggested that demographic characteristics such as these can have an impact on academic performance (Christmann, 2017; Amparo et al., 2018).

Face-to-Face Learning

F2F or traditional learning is a style of learning in which a teacher or instructor meets in person with students in a physical classroom at a specific time. In F2F learning, activities and instruction occur in the classroom without the use of online tools (D'Abundo & Sidman, 2018). This style allows learners to have direct and physical interaction with instructors and fellow students, ensures better understanding of lesson content, and gives class members a chance to work together (Amro et al., 2015).

Distance Learning

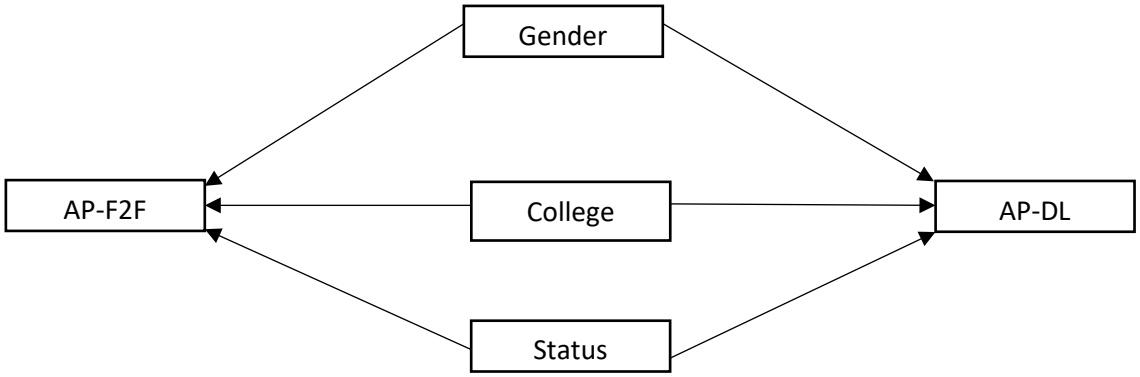
Distance learning, distance education, e-learning, online learning, computer-mediated learning, and Web-based learning refer to a process that takes place without physical presence. Unlike F2F learning, activities and instructions in DL occur through the use of learning technologies. F2F learning and DL have been explored by many researchers (Bernard et al., 2004; Shachar & Neumann, 2010; Nortvig et al., 2018).

Conceptual Framework

Figure 1 illustrates the conceptual framework of the study. The framework consists of three independent and two dependent variables. The independent variables are gender, college, and status of the student, while dependent variables are academic performance in F2F learning (AP-F2F) and academic performance in DL (AP-DL). The framework assumes the impact of demographic characteristics or independent variables on academic performance or dependent variables. This conceptual assumption is supported by a theoretical model proposed by Tinto (1975). According to his model, students who attend higher education possess a variety of attributes, experiences, and family backgrounds that may have a direct and indirect impact on their academic performance (Christmann, 2017; Amparo et al., 2018). Prior studies have used the model to identify the relationship between demographic characteristics and academic performance (Ibrahim et al., 2007; Amro et al., 2015). Accordingly, we found the model applied to the current topic.

Figure 1

The Proposed Conceptual Framework



Note. AP = academic performance; F2F = face-to-face learning; DL = distance learning.

Research Questions and Hypotheses

In light of the conceptual framework, the theoretical model proposed by Tinto (1975), and previous studies (Al-Mously et al., 2013;), we asked six research questions and proposed six hypotheses.

Research Questions

1. Does gender have an impact on academic performance in F2F learning?
2. Does a college have an impact on academic performance in F2F learning?
3. Does status have an impact on academic performance in F2F learning?
4. Does gender have an impact on academic performance in DL?
5. Does a college have an impact on academic performance in DL?
6. Does status have an impact on academic performance in DL?

Research Hypotheses

1. Gender is related to academic performance in F2F learning.
2. College is related to academic performance in F2F learning.
3. Status is related to academic performance in F2F learning.
4. Gender is related to academic performance in DL.
5. College is related to academic performance in DL.
6. Status is related to academic performance in DL.

Research Method

Study Population

The main objective of this study is to investigate the impact of demographic characteristics on academic performance. It uses students' grades and grade point averages (GPA) as indicators of academic performance in F2F learning and DL implemented to prevent the spread of COVID-19. As illustrated in Table 1, the population of the study are students enrolled in various courses offered by AAU as F2F in the first semester and DL in the second semester for the academic year 2019-2020.

Table 1

Sociodemographic Characteristics of Participants

Characteristic	*n*	%
Gender		
Male	294	49.7
Female	297	50.3
College		
English-based instruction [a]	290	49.1
Arabic-based instruction [b]	301	50.9
Status		
Junior [c]	280	47.4
Senior [d]	311	52.6

Note. $N = 591$.
[a] Engineering, pharmacy, and business. [b] Law, education, and communication. [c] 1st and 2nd year. [d] 3rd to 5th year.

Data Collection

Approval from a relevant AAU authority allowed researchers to collect data from the Admission and Registration Unit in June 2020. Based on the scope of the study, we collected two categories of data.

As presented in Table 2, the first category of data is based on 5,198 students' grades (i.e., A, B+, B, etc.) reported in F2F learning and DL courses during the first and second semesters for the academic year 2019-2020. The second category of data is based on 591 students' semester grade point averages (SGPA) and overall grade point averages (GPA) as reported in F2F learning and DL courses during the same semesters.

Table 2

Types of Collected Data

Category	Data	Number of students	Learning style
Grade	A, B+, B, C+, C, D+, D	5,198	F2F DL
SGPA	0.00-4.00	591	F2F DL
GPA	0.00-4.00	591	F2F DL

Note. SGPA = semester grade point average; GPA = grade point average; F2F = face to face learning; DL = distance learning.

Currently, AAU consists of six colleges. However, for statistical analysis, we decided to split the six colleges into two groups: (a) English-language colleges and (b) Arabic colleges. The first group consists of the colleges of Engineering, Pharmacy, and Business, while the second group consists of the colleges of Law,

Education, and Communication. Similarly, for the purposes of the research, we categorized the students as junior or senior. First- and second-year students are considered junior, while the third-, fourth-, and fifth-year students are senior in this study.

Data Treatment

The researchers coded and analyzed the collected data through IBM SPSS Statistics (Version 26). Because of the nature of the collected data, i.e., grade, SGPA, and GPA, validity and reliability tests, as well as factor analysis, were not required in this study. Frequency distributions, percentages, and statistical analysis were performed, analyzed, and interpreted to find answers to the research questions, and also to verify and validate the research hypotheses.

Findings

Grades in F2F Learning and DL

Our first analysis concerns students' grades. The reported grades shown in Table 3 are for 5,198 students from six colleges, registered in various courses of bachelor's, diploma, and master's programs, in semesters one and two of the academic year 2019-2020. The first semester was conducted through F2F learning while the second semester was delivered through DL to prevent the spread of the coronavirus. The table summarizes the d*ifferences between F2F learning and DL with respect to students' grades*. Similarly, Figure 2 compares the academic performance of BA students with MA and diploma students in F2F learning and DL.

Table 3

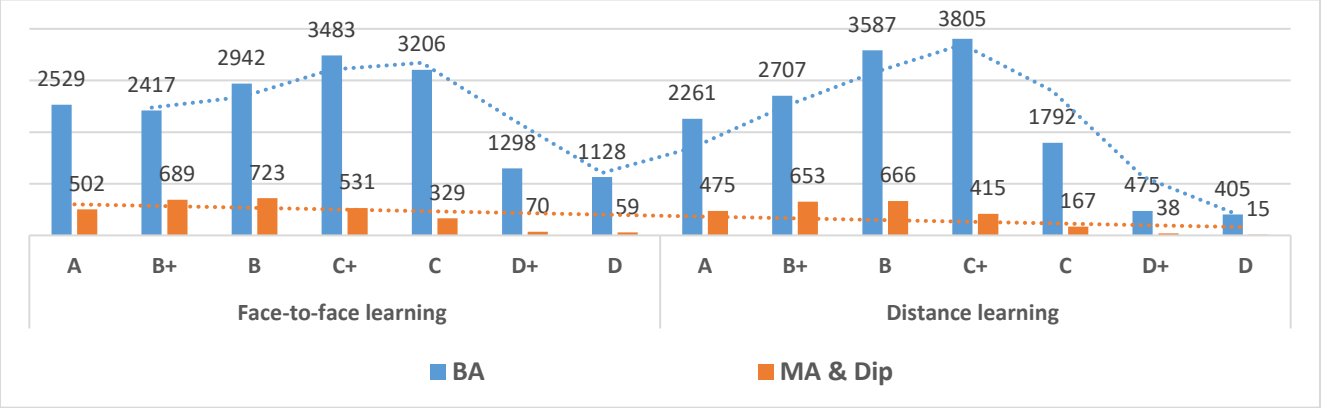
Mann-Whitney Test for the Difference Between F2F Learning and DL in Students' Grades

Grade	Teaching method	Total	Mean rank	Z-value	*p*-value
A	F2F	2909	11.55	-0.003	0.974
	DL	2622	11.45		
B+	F2F	2903	11.14	-0.263	0.793
	DL	3187	11.86		
B	F2F	3384	11.09	-0.296	0.768
	DL	3960	11.91		
C+	F2F	3648	11.41	-0.066	0.947
	DL	3887	11.59		
C	F2F	3275	12.64	-0.825	0.409
	DL	1803	10.36		
D+	F2F	1299	13.00	-1.122	0.262
	DL	475	10.00		
D	F2F	1132	12.91	-1.054	0.292
	DL	405	10.09		

Note. F2F = face-to-face learning; DL = distance learning.

Figure 2

Illustrates Additional Differences in Students' Academic Performances (Grades) in Respect to the Study Level



GPAs in F2F Learning and DL

The analysis in this section is based on a sample of 591 students selected randomly to compare semester grade point average (SGPA) against grade point average (GPA) in F2F learning and DL. As presented in Table 4, the findings show that 49% of students achieved 3.0 to 4.0 SGPA in DL compared to 38% of students in F2F learning courses. Similarly, 34% of students recorded a 3.0 to 4.0 GPA in DL compared to 31% of students in F2F learning. The number of students with less than 2.5 SGPA in F2F learning dropped sharply by 11% in DL. Likewise, the number of students with less than 2.5 GPA in F2F learning dropped slightly by 3% in DL.

Table 4

Students' GPAs in F2F Learning and DL

SGPA	F2F		DL		GPA	F2F		DL	
	N	%	*N*	%		*N*	%	*N*	%
3.6–4.0	92	15.56	112	18.95	3.6–4.0	79	13.36	78	13.19
3.0–3.59	133	22.50	183	30.96	3.0–3.59	109	18.44	126	21.31
2.5–2.99	126	21.31	122	20.64	2.5–2.99	118	19.96	124	20.98
2.0–2.49	110	18.61	90	15.22	2.0–2.49	170	28.76	166	28.08
<2.0	130	21.99	84	14.21	<2.0	115	19.45	97	16.41

Note. SGPA = semester grade point average; GPA = grade point average; F2F = face-to-face learning; DL = distance learning.

As presented in Table 5, students in DL demonstrated better academic performance in terms of SGPA (mean rank = 630.38) and GPA (mean rank = 604.13) than the students enrolled in F2F learning courses (SGPA mean rank = 552.62, GPA mean rank = 578.78). The differences in SGPA and GPA between the two learning styles are statistically significant (Z value = -3.917, *p*-value = 0.00). The findings suggest a positive impact of DL on students' academic performance.

Table 5

Results of the Mann-Whitney Test

Learning style	Academic performance	Mean rank	Z value	*p*-value
F2F	SGPA	552.62	-3.917	0.000*
DL		630.38		
F2F	GPA	578.87	-1.273	0.203
DL		604.13		

Note. *N* = 591.

* Significant at 0.05 (2-tailed).

Demographic Characteristics and Academic Performance

Table 6 summarizes the results of Spearman's rho correlation analysis applied to demographic characteristics and academic performance. This non-parametric test was preferred because an early normality test indicated that the data were not normally distributed. The demographic characteristics were

gender, college, and status of students. The analysis of correlation indicates a positive significant relationship between gender and SGPA in F2F learning (r_s = 0.251) and DL (r_s = 0.253). Similarly, findings reveal a positive significant relationship between students' status and overall GPA in F2F learning (r_s = 0.119) and DL (r_s = 0.117). Interestingly, the college variable indicates negative significant relationship with overall students' GPA in F2F learning (r_s = -0.125) and DL (r_s = -0.110). In addition, it has no significant relationship with SGPA in either F2F learning (r_s = -0.038) or DL (r_s = -0.060).

Table 6

*Spearman's Rho Test Results Showing Correlation of Study Variables**

Variable	1	2	3	4	5
1. Gender	—				
2. College	-.083*	—			
3. Status	.134**	-.050	—		
4. SGPA (F2F)	.251**	-.038	.153**	—	
5. SGPA (DL)	.243**	-.060	.198**	.802**	—
6. GPA (F2F)	.242**	-.125**	.119**	.899**	.796**
7. GPA (DL)	.246**	-.110**	.117**	.888**	.877**

Based on the results of Spearman's correlation analysis which confirmed the relationship between students' academic performance and demographic characteristics, we performed a linear regression analysis to find out the impact of these variables on academic performance. The researchers assumed that gender, college, and status have a positive impact on a student's academic performance. The linear regression tests are based on the partial least squares structural equation modelling (PLS-SEM). Table 7 defines the symbols used in the models.

$$\text{Model 1: } Y_1 = \beta_0 + \beta_1\, Gender + \beta_2 College + \beta_3 Status + \varepsilon$$

$$\text{Model 2: } Y_2 = \beta_0 + \beta_1\, Gender + \beta_2 College + \beta_3 Status + \varepsilon$$

Table 7

Definitions of Variables

Variable	Definition
Y1	academic performance in F2F learning
Y2	academic performance in DL
Gender	= 1 if respondent is male, 0 if female
College	= 1 if respondent is from English instruction college, 0 if Arabic
Status	= 1 if respondent is junior, 0 if senior
ε	errors

The models are based on the stated hypotheses. These hypotheses propose the impact of gender, college, and status of a student on academic performance in both F2F learning and DL. As presented in Table 8, findings of regression analyses indicate that gender, college, and status of student have positive and significant impact on students' academic performance in F2F learning (R^2 = 0.075, adjusted R^2 = 0.071, F = 15.929, p-value = 0.000) and DL (R^2 = 0.074, adjusted R^2 = 0.070, F = 15.737, p-value = 0.000). These results support the hypotheses and models of the study. Besides, the findings reveal that gender, college, and status of student explain at least 7.4% of the variation of students' academic performance in both F2F learning and DL. Although these results appear very weak, they indicate the existence of causation between demographic variables and academic performance.

Table 8

Demographic Characteristics and Academic Performance

Variable	Academic performance in F2F learning		Academic performance in DL	
	Model 1		Model 2	
	Coefficient	p-value	Coefficient	p-value
Constant	2.201	0.000	2.182	0.000
Gender	0.317	0.000	0.318	0.000
College	-0.164	0.005	-0.126	0.027
Status	0.119	0.044	0.124	0.031

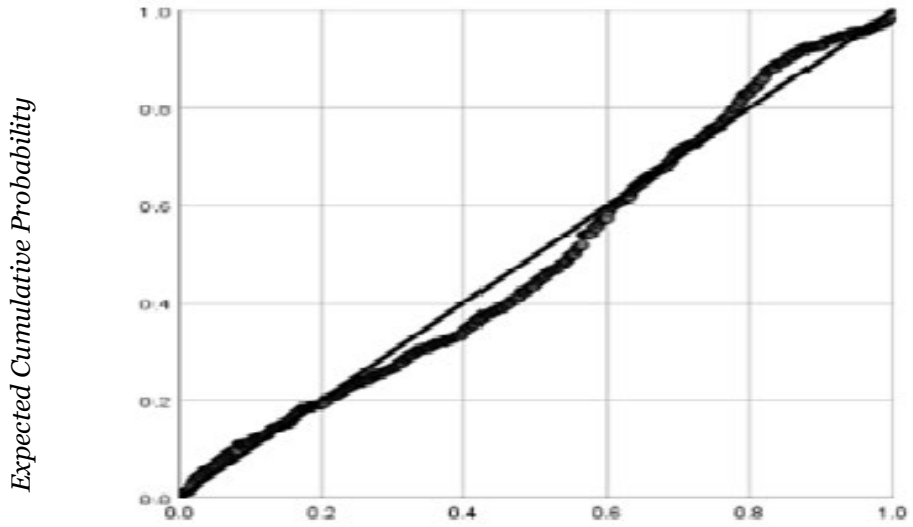
Note. Model 1: R^2 = 0.075, adjusted R^2 = 0.071, F = 15.929, p-value = 0.000;

Model 2: R^2 = 0.074, adjusted R^2 = 0.070, F = 15.737, p-value = 0.000.

The remaining variations in students' academic performance might be explained by other factors not investigated in this study. This can be observed in figures 3 and 4, which, since the lines in both figures deviate from the diagonals, indicate unexplained variance in the models.

Figure 3

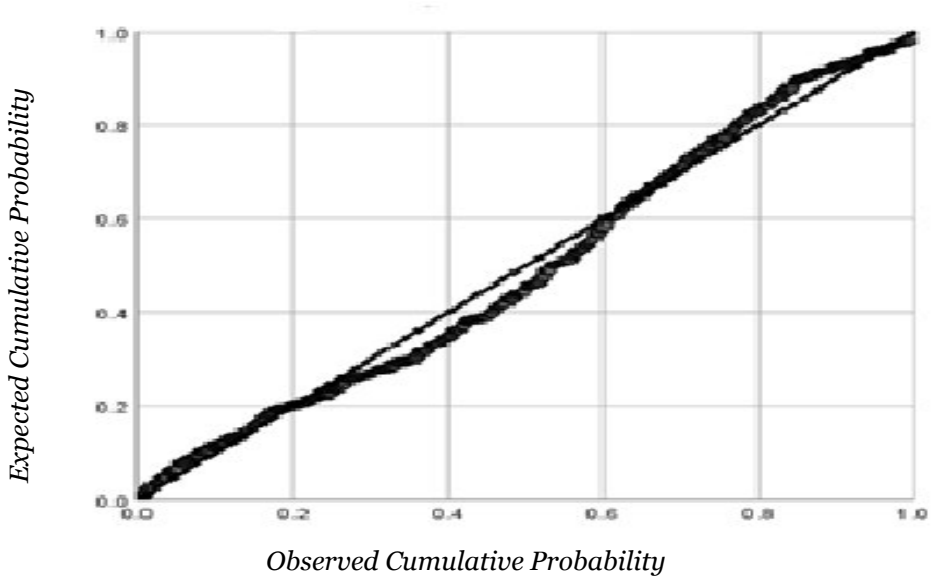
Normal Probability Plot of Regression Standardized Residual. The figure illustrates GPA as dependent variable as mentioned in Model 1 (F2F Learning)



Note. GPA = grade point average; F2F = face to face learning.

Figure 4

Normal Probability Plot for Variable GPA in Model 2 (DL)



Note. GPA = grade point average; DL = distance learning.

Discussion

This study reports the impact of demographic characteristics on students' academic performance in F2F learning and DL. The results indicate that in terms of grade categories such A, B+, and B, students demonstrated better academic performance in DL than in F2F learning. Similarly, findings reveal a significant difference between F2F learning and DL for both SGPA and overall GPA. The mean score analysis of these differences shows better academic performance in DL than in F2F learning. The findings support the hypotheses and suggest a positive impact of DL on students' academic performance. These differences could be related to the use of innovative technologies and digital resources in DL. DL technologies and tools serve as vehicles and contribute to students' academic performance (Haddad et al., 2014; Cheng et al., 2017). According to Rajadurai et al. (2018), DL technologies, the quality and effectiveness of courses, and Internet efficacy are among the factors that can have a positive impact on students' performance.

These differences could also be related to teaching style. As highlighted by Natarajan (2005), innovative teaching methods used in DL help sustain student's interest and make the learning process more productive and interesting. DL provides many opportunities to students, including unlimited access to learning materials such recorded lectures, networking with people from different geographical locations and different cultures, convenience in terms of timing, actual duration, concentration, transportation and

payment, and objectivity better achieved as compared to F2F learning (Koutsoupidou, 2014). These advantages may have a positive impact on students' academic performance in DL.

Another possibility for the difference shown in the research is academic dishonesty. Despite the advancement of educational technologies in preventing academic dishonesty in online education, students cheat and plagiarize in DL more frequently than they do in F2F learning. Prior studies have reported students' dishonesty in DL (Jocoy & DiBiase, 2006; Michael & Williams, 2013). Recent research by Lucky et al. (2019) found that the incidence of cheating among students of DL was 12 times higher compared to students of F2F learning. Similarly, a report by Chirumamilla et al. (2020) showed that students perceived cheating to be much easier in online examinations than in physical classroom examinations. We believe that the evaluation of students' academic performance in DL should consider academic dishonesty (Lucky et al., 2019).

Meanwhile, the findings of the study revealed the impact of demographic characteristics on academic performance. Accordingly, the results supported the theory proposed by Tinto (1975), the stated hypotheses, and the proposed models. Further analysis indicated that gender, college, and status of student explained at least 7.4% of the variation in academic performance in F2F learning and DL. Certainly, learners are different, unique, and not necessarily equal in intellectual abilities, skills, and experiences (Halpern et al., 2007; Hedges & Friedman, 1993). Accordingly, such factors could have a significant positive influence on their academic performance. Likewise, different colleges have different characteristics that could have a positive impact on students' academic performance. These include knowledge and experience of faculty members, teaching methods and approaches, and provision of needed learning and teaching materials and equipment (Arora & Singh, 2017). Similarly, concerning students' status, senior students show better academic performance compared to junior students. This is because senior students have more knowledge, skills, and experience in the higher education environment as compared to junior students (Hassanbeigi et al., 2011).

Conclusion

The spread of COVID-19 has created an opportunity for many educational institutions to implement DL for the first time. In implementing DL, these institutions have been able to successfully continue to provide educational resources and services to students, secure income and revenues for the institution, and contribute to the control and prevention of coronavirus pandemic in society. At AAU, the experience has been remarkable, particularly in academic performance. Despite the pandemic crisis, students achieved better academic performance in DL than in F2F learning. The implementation of DL resulted in a smaller number of weak students and an increase in the number of students with higher GPAs. However, these results are not in isolation from the impact of gender, college, and status of students. The three demographic characteristics have demonstrated a significant impact on students' academic performance in both F2F learning and DL. Non-DL institutions should continue offering DL programs side-by-side with F2F learning programs. This will attract more students and prepare for any other circumstances that might prevent the provision of F2F learning. Future researchers may wish to explore the impact of other demographic characteristics in assessing students' academic performance in both F2F learning and DL.

References

Alghamdi, A., Karpinski, A. C., Lepp, A., & Barkley, J. (2020). Online and face-to-face classroom multitasking and academic performance: Moderated mediation with self-efficacy for self-regulated learning and gender. *Computers in Human Behavior*, *102*, 214-222. https://doi.org/10.1016/j.chb.2019.08.018

Al-Mously, N., Salem, R., & Al-Hamdan, N. (2013). The impact of gender and English language on the academic performance of students: An experience from new Saudi medical school. *Journal of Contemporary Medical Education*, *1*(3), 170-176. https://www.jcmedu.org/jcmedu-articles/the-impact-of-gender-and-english-language-on-the-academic-performance-of-students-an-experience-from-new-saudi-medical-s.pdf

Amparo, A. R., Smith, G., & Friedman, A. (2018). Gender and persistent grade performance differences between online and face to face undergraduate classes. In T. Bastiaens, J. Van Braak, M. Brown, L. Cantoni, M. Castro, R. Christensen, G. Davidson-Shivers, K. DePryck, M. Ebner, M. Fominykh, C. Fulford, S. Hatzipanagos, G. Knezek, K. Kreijns, G. Marks, E. Sointu, E. Korsgaard Sorensen, J. Viteli, J. Voogt … O. Zawacki-Richter (Eds.), *Proceedings of EdMedia: World Conference on Educational Media and Technology* (Vol. 2018, pp. 1935-1939). Association for the Advancement of Computing in Education (AACE). https://www.learntechlib.org/primary/p/184430/

Amro, H. J., Mundy, M.-A., & Kupczynski, L. (2015). The effects of age and gender on student achievement in face-to-face and online college algebra classes. *Research in Higher Education Journal*, *27*, 1-22. http://www.aabri.com/manuscripts/142077.pdf

Andreou, E., Vlachos, F., & Andreou, G. (2007). Educational research approaches to studying among Greek university students: The impact of gender, age, academic discipline and handedness. *Educational Research, 48*(3), 301-311. https://doi.org/10.1080/00131880600992363

Arora, N., & Singh, N. (2017). Factors affecting the academic performance of college students. *I-Manager's Journal of Educational Technology*, *14*(1), 47-53. https://doi.org/10.26634/jet.14.1.13586

Ati, M., & Guessoum, N. (2010). E-learning in the United Arab Emirates. In U. Demiray (Ed.), *E-learning practices. Cases on challenges facing e-learning and national development: Institutional studies and practices* (Vol. 2, pp. 1009-1028). Anadolu University. https://www.researchgate.net/publication/233428047_E-Learning_in_the_United_Arab_Emirates

Bernard, R. M., Abrami, P. C., Lou, Y., Borokhovski, E., Wade, A., Wozney, L., Wallet, P. A., Fiset, M., & Huang, B. (2004). How does distance education compare with classroom instruction? A meta-analysis of the empirical literature. *Review of Educational Research*, *74*(3), 379-439. https://doi.org/10.3102/00346543074003379

Brubacher, M. R., & Silinda, F. T. (2019). Enjoyment and not competence predicts academic persistence for distance education students. *International Review of Research in Open and Distributed Learning*, *20*(3), 165-179. https://doi.org/10.19173/irrodl.v20i4.4325

Cheawjindakarn, B., Suwannatthachote, P., & Theeraroungchaisri, A. (2012). Critical success factors for online distance learning in higher education: A review of the literature. *Creative Education*, *03*(8B), 61-66. https://doi.org/10.4236/ce.2012.38b014

Cheng, F.-F., Chiu, C.-C., Wu, C.-S., & Tsaih, D.-C. (2017). The influence of learning style on satisfaction and learning effectiveness in the asynchronous web-based learning system. *Library Hi Tech*, *35*(4), 473-489. https://doi.org/10.1108/LHT-12-2016-0151

Chirumamilla, A., Sindre, G., & Nguyen-Duc, A. (2020). Cheating in e-exams and paper exams: The perceptions of engineering students and teachers in Norway. *Assessment and Evaluation in Higher Education*, *45*(7), 940-957. https://doi.org/10.1080/02602938.2020.1719975

Christmann, E. P. (2017). A comparison of the achievement of statistics students enrolled in online and face-to-face settings. *E-Learning and Digital Media*, *14*(6), 323-330. https://doi.org/10.1177/2042753017752925

D'Abundo, M. L., & Sidman, C. (2018). Integrating web-based technologies into the education and training of health professionals. In M. Khosrow-Pour, D.B.A. (Ed.), *Encyclopedia of information science and technology* (4th ed., pp. 5820-5828). IGI Global. https://doi.org/10.4018/978-1-5225-2255-3.ch506

Duffy, T., Gilbert, I., Kennedy, D., & Kwong, P. W. (2002). Comparing distance education and conventional education: Observations from a comparative study of post-registration nurses. *Research in Learning Technology*, *10*(1), 70-82. https://doi.org/10.1080/0968776020100110

Elfaki, N. K., Abdulraheem, I., & Abdulrahim, R. (2019). Impact of e-learning vs traditional learning on students performance and attitude. *International Journal of Medical Research & Health Sciences*, *8*(10), 76-82. https://www.ijmrhs.com/medical-research/impact-of-elearning-vs-traditional-learning-on-students-performance-and-attitude.pdf

Fadda, A. (2019). The relationship between self-regulations and online learning in an ESL blended learning context. *English Language Teaching*, *12*(6), 87-93. https://doi.org/10.5539/elt.v12n6p87

Ferguson, J., & Tryjankowski, A. M. (2009). Online versus face-to-face learning: Looking at modes of instruction in master's-level courses. *Journal of Further and Higher Education*, *33*(3), 219-228. https://doi.org/10.1080/03098770903026149

Haddad, M. E. O., Ferreira, N. S. C., & Faria, A. A. (2014). The use of educational technologies in distance education: Enabling the appropriation of teaching and learning process. *Open Journal of Social Sciences*, *2*(1), 54-58. https://doi.org/10.4236/jss.2014.21006

Halpern, D. F., Benbow, C. P., Geary, D. C., Gur, R. C., Hyde, J. S., & Gernsbacher, M. A. (2007). The science of sex differences in science and mathematics. *Psychological Science in the Public Interest*, *8*(1), 1-51. https://doi.org/10.1111/j.1529-1006.2007.00032.x

Hassanbeigi, A., Askari, J., Nakhjavani, M., Shirkhoda, S., Barzegar, K., Mozayyan, M. R., & Fallahzadeh, H. (2011). The relationship between study skills and academic performance of university students. *Procedia-Social and Behavioral Sciences*, *30*, 1416-1424. https://doi.org/10.1016/j.sbspro.2011.10.276

Hedges, L. V., & Friedman, L. (1993). Gender differences in variability in intellectual abilities: A reanalysis of Feingold's results. *Review of Educational Research*, *63*(1), 94. https://doi.org/10.2307/1170561

Ibrahim, M., Rwegasira, K. S. P., & Taher, A. (2007). Institutional factors affecting students' intentions to withdraw from distance learning programs in the Kingdom of Saudi Arabia the case of the Arab Open University (AOU). *Online Journal of Distance Learning Administration*, *10*(1), 1-19. https://www.westga.edu/~distance/ojdla/spring101/ibrahim101.htm

Ismail, A. O. A., Mahmood, A. K., & Abdelmaboud, A. (2018). Factors influencing academic performance of students in blended and traditional domains. *International Journal of Emerging Technologies in Learning*, *13*(2), 170-187. https://doi.org/10.3991/ijet.v13i02.8031

Jahng, N., Krug, D., & Zhang, Z. (2007). Student achievement in online distance education compared to face-to-face education. *European Journal of Open, Distance and E-Learning*, *10*(1), 1-16. https://core.ac.uk/download/pdf/24065525.pdf

Jocoy, C., & DiBiase, D. (2006). Plagiarism by adult learners online: A case study in detection and remediation. *The International Review of Research in Open and Distributed Learning*, *7*(1), 1-16. https://doi.org/10.19173/irrodl.v7i1.242

Kamalluarifin, W.S.F.W., Aniza, F.N.F.M., Jayabalan, H., Saufi, M.L.H.M., Bakar, N.A.A., & Karib, S.H.F. (2018). Blended learning: Satisfaction among accounting students in UNITEN KSHAS. *Global Business & Management Research*, *10*(3), 547-557. https://drive.google.com/file/d/1yoHxe-qOrcxU8otrtUChK_SEiPf2ErH_/view

Koutsoupidou, T. (2014). Online distance learning and music training: Benefits, drawbacks and challenges. *Open Learning: The Journal of Open, Distance and E-Learning*, *29*(3), 243-255. https://doi.org/10.1080/02680513.2015.1011112

Lavine, J., & Croome, R. (2018). United Arab Emirates.I In A.S. Weber & S. Hamlaoui (Eds.), *E-learning in the Middle East and North Africa (MENA) region* (pp. 433-450). Springer.

Logan, J. W., Lundberg, O. H., Roth, L., & Walsh, K. R. (2017). The effect of individual motivation and cognitive ability on student performance outcomes in a distance education environment. *Journal*

of Learning in Higher Education, *13*(1), 83-91. https://jwpress.com/Journals/JLHE/BackIssues/JLHE-Spring-2017.pdf

Lucky, A., Branham, M., & Atchison, R. (2019). Collection-based education by distance and face to face: Learning outcomes and academic dishonesty. *Journal of Science Education and Technology*, *28*, 414-428. https://doi.org/10.1007/s10956-019-9770-8

Michael, T.B., & Williams, M.A. (2013). Student equity: Discouraging cheating in online courses. *Administrative Issues Journal: Education, Practice, and Research*, *3*(2), 30-41. https://dc.swosu.edu/aij/vol3/iss2/6

Natarajan, M. (2005). Innovative teaching techniques in physical education. *Communication of the IIMA*, *5*(4), 73-80. https://scholarworks.lib.csusb.edu/ciima/vol5/iss4/10/

Nortvig, A.-M., Petersen, A. K., & Balle, S. H. (2018). A literature review of the factors influencing e-learning and blended learning in relation to learning outcome, student satisfaction and engagement. *The Electronic Journal of E-Learning*, *16*(1), 46-55. http://www.ejel.org/volume16/issue1

Ortega-Maldonado, A., Llorens, S., Acosta, H., & Coo, C. (2017). Face-to-face vs on-line: An analysis of profile, learning, performance and satisfaction among post graduate students. *Universal Journal of Educational Research*, *5*(10), 1701-1706. https://doi.org/10.13189/ujer.2017.051005

Paul, J., & Jefferson, F. (2019). A comparative analysis of student performance in an online vs. face-to-face environmental science course from 2009 to 2016. *Frontiers in Computer Science*, *1*(article 7), 1-9. https://doi.org/10.3389/fcomp.2019.00007

Rajadurai, J., Alias, N., Jaaffar, A. H., & Hanafi, W. N. W. (2018). Learners' satisfaction and academic performance in open and distance learning (ODL) universities in Malaysia. *Global Business and Management Research*, *10*(3), 511-523. http://gbmrjournal.com/vol10no3.htm

Shachar, M., & Neumann, Y. (2010). Twenty years of research on the academic performance differences between traditional and distance learning: Summative meta-analysis and trend. *MERLOT Journal of Online Learning and Teaching*, *6*(2), 318-334. http://jolt.merlot.org/vol6no2/shachar_0610.pdf

Smith, N. V. (2013). Face-to-face vs. blended learning: Effects on secondary students' perceptions and performance. *Procedia-Social and Behavioral Sciences*, *89*, 79-83. https://doi.org/10.1016/j.sbspro.2013.08.813

Stark, E. (2019). Examining the role of motivation and learning strategies in the success of online versus face-to-face students. *Online Learning Journal*, *23*(3), 234-251. https://doi.org/10.24059/olj.v23i3.1556

Stegers-Jager, K. M., Savas, M., van der Waal, J., van Rossum, E. F. C., & Woltman, A. M. (2020). Gender-

specific effects of raising Year-1 standards on medical students' academic performance and stress levels. *Medical Education*, *54*(6), 538-546. https://doi.org/10.1111/medu.14068

Tamim, R. M., Bernard, R. M., Borokhovski, E., Abrami, P. C., & Schmid, R. F. (2011). What forty years of research says about the impact of technology on learning: A second-order meta-analysis and validation study. *Review of Educational Research*, *81*(1), 4-28. https://doi.org/10.3102/0034654310393361

Tinto, V. (1975). Dropout from higher education: A theoretical synthesis of recent research. *Review of Educational Research*, *45*(1), 89-125. https://doi.org/10.3102/00346543045001089

United Arab Emirates, the Ministry of Education (2020, March 4). *Education ministry announces early 4-week spring vacation, starting Sunday* [Press release]. https://www.moe.gov.ae/en/mediacenter/news/pages/springvacation.aspx

United Arab Emirates' Government Portal. (2020, August 25). *School break amid COVID-19*. https://u.ae/en/information-and-services/education/school-break-amid-covid19

Urtel, M. G. (2008). Assessing academic performance between traditional and distance education course formats. *Educational Technology and Society*, *11*(1), 322-330. http://www.jstor.org/stable/jeductechsoci.11.1.322

Zhao, L., & Abuizam, R. (2015). The impact of adaptive learning in an introductory management distance education course: An empirical comparison. *Academy of Educational Leadership Journal*, *19*(3), 359. https://www.questia.com/library/journal/1P3-3966658211/the-impact-of-adaptive-learning-in-an-introductory

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Improving Intergroup Relations Through Online Contact

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Abstract

This study examined an online professional development program designed to support meaningful acquaintance and reduce stereotypes and prejudices among teachers from different cultures in Israeli society. The rationale of the online program was based on the premise that indirect online contact might improve intergroup relations in diverse societies. The program was designed to progress gradually, starting from basic and leading to a deeper acquaintance, using a variety of computer-mediated communication (CMC) tools. Findings indicated that upon program completion, participants were more respectful towards one another than pre-program. They held a positive view of online learning and were open to multiculturalism (more tolerant and accepting of others than previously) while still maintaining their respective cultural identities. The program participants noticed the gradual progression in task design, expressly noting that this stepwise structure supported forging a connection and then fostering familiarization. This study fills a gap in the research through demonstrating ways that online contact (indirect contact) can be used to promote acquaintance and reduce stereotypes and prejudices among teachers from different groups in Israeli society.

Keywords: indirect contact, online contact, multicultural education, teachers, computer-mediated communication

Introduction

The world is becoming increasingly diverse with respect to cultures and subcultures (Ariely, 2011). Simultaneously, categories of *them* and *us*, *home* and *away*, and *east* and *west* remain common terms used to create psychological distances between people, nations, and continents (Kinnvall & Lindén, 2010). Israel, as a multicultural society, provides a compelling example of one nation harboring significant cultural differences (Cohen, 2018). Furthermore, the Israeli educational system reflects these differences and is divided into several sectors differentiated along national-ethnic (Jews/Arabs) and religious (secular Jews/religious-nationalist Jews) lines (Katz, 2013; Sabbagh & Resh, 2014). As a result, teachers and students rarely meet people who are different from themselves and their "home" groups. This lack of meaningful interaction is characterized by phenomena such as prejudices, generalizations, and racism between the groups (Bar-On, 2008). Therefore, teachers with multicultural experiences play an essential role as agents of change in multicultural education and as role models for their students (see Shapira et al., 2020 for details).

In this paper, we discuss findings from an innovative online teacher professional development (TPD) program for teachers from several sectors in Israel (Jewish secular, Jewish orthodox, Arabs, and different subcultures in Jewish and Arab society). The online contact occurred in a Moodle platform that included guidelines to connect online using a variety of computer-mediated communication (CMC) tools. The rationale of the online TPD program was based on the premise that indirect online contact can improve intergroup relations (Walther et al., 2015).

The current study examined ways to design optimal online contact and explored how such contact may affect intergroup relations. Two questions guided our research:

1. How could we design indirect online contact that leads to meaningful acquaintance among teachers from different cultures?

2. Could the use of technology reduce stereotypes and prejudices among teachers, and, if so, how?

Theoretical Background

Society in the Global Era

The term *globalization* is frequently used to refer to the increased tendency of people in disparate parts of the globe to meet each other (Diaz & Zirkel, 2012). In addition to the differences resulting from immigration, countries' domestic populations include ethnic, linguistic, and religious diversity (Patsiurko et al., 2012), as well as Indigenous or native minorities (Clarke, 2001; Van Cott, 2005). The diversity of societies is an essential factor in shaping national identity and intergroup relations (Rodriguez, 2003). Unless a common goal binds the different groups together, tribal hostilities, as well as racial and ethnic conflicts will and do drive them apart (Kinnvall & Lindén, 2010). Additional implications on intergroup relations include people's tendencies to connect and conduct interpersonal ties with those most similar to them.

Homophily—Meeting Only With People Like Me

The similarity between the members of social groups, or between individuals sharing a social link has long been observed and studied (Aiello et al., 2012). The homophily principle or the idea that similarity breeds connection structures network ties of every type (Bisgin et al., 2010; McPherson et al., 2001). The factors that govern the construction of ties in the real world also govern the construction of friendship ties in social media. In a world of networked media, it is difficult to get access views from people who hold different perspectives. Information in social media flows in ways that create and reinforce social divides (Aiello et al., 2012). Homophily's effects are observed in many social networks concerning age, ethnicity, religion, and the like (McPherson et al., 2001). Studies conducted among U.S. college students have found segregation based on ethnicity and race is as high on social media as it is on campuses (see Hofstra, 2017; McPherson et al., 2001).

In a reality of alienation and separation between groups and people who connect only with people like them, both in everyday life and online, intervention is needed to improve intergroup relations. The main approach to relationship improvement is based on the *contact theory*.

Intergroup Contact

Intergroup contact, under appropriate conditions, may increase positive intergroup emotions and enhance empathy, as well as reduce negative emotions (Pettigrew & Tropp, 2006, 2008; Tam et al., 2008). Contact improves intergroup relations by enhancing knowledge about the out-group and reducing perceived threat and apprehension regarding meeting members of the other group. Contact enables one to assume the perspective of out-group members and may contribute to improved intergroup attitudes (Pettigrew & Tropp, 2008). Four conditions are specified for optimal intergroup contact: equal group status within the situation, common goals, intergroup cooperation, and support from authorities (Allport, 1954). These optimal conditions are difficult to achieve in a reality of division, alienation, and homophily. However, indirect contact seems to provide a viable option for improving intergroup relations, fostering intergroup empathy and reducing negative emotions (Batson & Ahmad, 2009; Shapira et al., 2016; Stathi & Crisp, 2008; Walther et al., 2015). The term *indirect contact* includes various forms of contact that do not include face-to-face encounters between the in-group and the out-group, including online contact, which is intergroup interactions via new technologies (Kim & Wojcieszak, 2018).

Improving Intergroup Relations Through Online Intergroup Contact

Research indicates that given the proper conditions, indirect contact can elicit positive intergroup attitudes (Amzalag et al., 2015; Paluck, 2009; Stathi & Crisp, 2008; Steinberg & Bar-On, 2002). With the growth and popularity of CMC, scholars claim that intergroup contact theory can be fruitfully applied to online contexts (Amichai-Hamburger & McKenna, 2006; Hasler & Amichai-Hamburger, 2013). Empirical research of these propositions indeed finds positive effects of indirect online contact on the reduction of prejudice and intergroup bias (Lev-On & Lissitsa, 2015), and potential for reducing out-group prejudice (Amichai-Hamburger & McKenna, 2006; Hasler & Amichai-Hamburger, 2013). For example, online contacts between Jews and Arabs in Israel minimize the social distance that Israeli Jews maintain toward Arabs (Lev-On & Lissitsa, 2015). Virtual groups who communicated during a yearlong online course, which included students from the three major Israeli education sectors—religious Jews, secular Jews, and Arabs—showed reduced prejudice toward the respective out-groups (Walther et al., 2015).

The current study focused on online intergroup contact between teachers from several sectors in Israel. The teachers met online and gained significant acquaintance with one another in a variety of ways that will be described in the methodology section.

Methodology

This study used a mixed methods approach, combining quantitative and qualitative research tools for data analysis (Anderson & Shattuck, 2012). Such a combination allows for a solid foundation and in-depth comprehension of results as well as facilitates the discovery of novel perspectives (Creswell, 2013; Dunning et al., 2008; Patton, 2002).

In the present study, various means were used to collect data, which enabled triangulation of the findings to strengthen the validity of the results (Flick, 2004). The research was conducted as part of the online teacher professional development (TPD) program extending over a six-month period (October-March) and published at the Center for Educational Technology (CET). The TPD program was intended to encourage significant online acquaintance and included 30 hours of interactions among participating teachers. The entire TPD program was conducted online using the Moodle platform and facilitated by this paper's authors. Considering the tendency towards ethnic homophily on online social networks (Hofstra et al., 2017; McPherson et al., 2001), the collaborative activities aimed to support teachers to get to know one another through online contact and develop meaningful relationships, thereby reducing stereotypes and prejudice.

The TPD program was designed to progress gradually, starting from basic and leading to in-depth acquaintance.

There were seven assignments, as delineated in Table 1.

Table 1

The TPD Program Design – The Seven Assignments, Their Rationale Characteristics and Duration, the Interventions, and the Data Collection Tools

Activity name	Activity rationale	Instructional design		Data collection tool	Activity duration
		Activity characteristic	Instructor intervention during the activity		
Israeli society meets on the Net (pre)	Participants' attitudes towards multiculturalism and online acquaintance before the TPD program	Answer an online questionnaire		Survey	10 min
First acquaintance	First acquaintance through pictures	1. Upload a representative picture, without identifying details 2. Respond to 3 colleagues' pictures by guessing and writing who was behind the image and their rationale for the "guess"	1. All pictures and responses are anonymous 2. Ask participants to respond to anyone who has not yet received a response	Padlet	4 hr
True or false	To encourage interactions between participants and arouse curiosity	1. Write a paragraph about myself 2. Write 5 facts: 3 false and 2 true 3. Respond to 3 participants by writing in the online forum what is true, what is false, and why	Send all participants an e-mail that asks them to respond to anyone who has not yet received a response Use encouraging phrases such as: "What an interesting comment!"	Online forum	4 hr
A sense of place	To encourage interactions and deeper acquaintance between participants	1. Upload a picture that presents a sense of place and indicate what the image means to me	Send all participants an e-mail that:	Google slide	4 hr

		2. Respond to 2 participants about what they learned, felt, and thought about the picture	1. Asks them to respond to anyone who has not yet received a response 2. Uses encouraging phrases such as: "There are no less than 93 personal, exciting, and interesting photos and stories, but there are some that were missed" (didn't get a response)		
Conversation between 2 participants	To pair participants according to different national, religious, and gender identities, where they lived, etc., to create a more profound and personal acquaintance	1. Talk with another participant 2. Record or transcribe the conversation 3. Write a description of the partner 4. Respond to 3 other participants about their discussion	Send all participants an e-mail that encourages participation. For example: "The Google slide is full of interesting acquaintances and interviews between the pairs. At the same time, some have not received a reply. Please respond to them."	Google slide	4 hr
Israeli society meets on the Net (post)	Attitudes towards multiculturalism and online acquaintance after the TPD program	Answer an online questionnaire		Survey	10 min
Reflection	A retrospective of the process that each participant underwent during the TPD program	Answer guiding questions such as: • What do I think about meeting online with various groups in Israeli society? • What are your main insights from the course? • What did I feel and think before the course and what do I feel and think now?		Online forum	4 hr

Participants

Eighty-five teachers participated in the TPD program, 16 men and 69 women. Their average age was 41.6 (*SD* = 8.9). Fifty-nine participants were Jewish, and 26 Arabs. Forty-five percent hold bachelor's degrees, and 49% hold master's degrees. Forty participants defined themselves as secular and 15 as religious and all the rest defined themselves as traditional. Forty-two participants teach in elementary school and the remainder in middle and high schools.

Data Collection and Data Analysis Methods

Quantitative and qualitative data were collected from a questionnaire and from the products of the TPD program tasks, which included pictures and text.

We analyzed the pictures and texts using an interpretive approach, identifying key themes (Braun & Clark, 2006) and relying on theoretical concepts of intergroup relations (Batson & Ahmad, 2009; Stathi & Crisp, 2008). The data were analyzed by the two researchers, separately, to enhance the reliability of the qualitative data.

The First Questionnaire (Pre-)

A three-part questionnaire based on the research of Laron and Lev Ari (2013) and Holladay et al., (2003) included questions relating to gender, education, national affiliation, religion, and attitudes toward multiculturalism and online acquaintance.

Participants were asked to indicate their attitudes by rating items using a Likert scale (1 = *do not agree at all* to 5 = *agree to a large extent*). The questionnaire was written on Google Forms and distributed online through the Moodle platform. The participants completed this questionnaire at the beginning of the TPD program.

The Second Questionnaire (Post-)

After the TPD, participants completed a five-part questionnaire including three parts identical to the pre-questionnaire and two new parts about the TPD program and attitudes towards online learning. The items were derived from previous questionnaires (Maruyama et al., 2000; Pohan & Aguilar, 2001; Rew et al., 2003; Holladay et al., 2003; Laron & Lev Ari, 2013) with specific adaptations to the topic of the current study.

The quantitative data were analyzed using SPSS software, including frequency tests and pair sample *t*-tests.

Data Collection and Analysis

Although there were seven stages, due to space constraints, we describe in-depth three main stages in Table 2.

Table 2

Data Collection Tools, Quantitative or Qualitative Data, Data Analysis, and Themes

Data collection tool	Quantitative/Qualitative data	Analysis	Theme
Questionnaires (pre and post)	Quantitative Pre and post questionnaire: • background (11 questions) • attitudes towards multiculturalism (12 items) • online acquaintance (8 items) Only in the post questionnaire: • implementing a multiculturalism approach during the program (29 items) • online learning during the program (7 items) • two open-ended questions	Frequency tests and pair sample *t*-test using SPSS	
A sense of place	Qualitative and quantitative	• Dividing visual and textual content into themes (qualitative) • Counting the number of the content in each theme (quantitative)	Family, home, sea view, landscape view, pets, hobbies
Reflections	Qualitative	Dividing textual content into themes	All aspects of Israeli society, multicultural education, integrating teaching technology tools as a means of knowing people, TPD program design, participants' feelings and insights, advantages and disadvantages of the TPD program, finding a common denominator

Note. The researchers separately analyzed the content. Initially, they reached a 71% match, and, after reviewing category accuracy, they reached an 84% match.

Findings

The findings are presented via research questions.

Research Question 1

The first research question asked in what ways indirect online contact could be designed to lead to meaningful acquaintance between teachers from different cultures. First presented are findings from the questionnaire, followed by findings arising from the various tasks undertaken by the teachers in the TPD program.

Research Variables and Descriptive Statistics

Table 3 presents the research variables' means and respective Cronbach's alpha internal consistency.

Table 3

Descriptive Statistics of Research Variables' Means and Internal Consistency

Variable	Item for example	*M*	*SD*	α
Respect towards one another	"The TPD program was sensitive to the participants' cultures."	4.64	0.46	0.85
Online learning	"The TPD program (structure, activity) contributed to the learning."	4.41	0.48	0.85
Openness towards multiculturalism	"Multicultural education is more important than reading, math and computer literacy."	3.90	0.72	0.88
Cultural identity	"My beliefs and attitudes are influenced by my culture."	3.72	1.01	0.92
Behavioral changes	"The TPD program affected my opinions about other cultures."	3.66	0.98	0.86
Opportunity to get acquainted with another culture (on the Net)	"The internet allowed me to meet people I could not have met in any other way."	3.16	0.96	0.73

As Table 3 shows, the research variables exhibit a medium to very high internal consistency, except for the last variable, which is approaching the absolute minimum acceptable level of 0.7. One could further note from these results that, in the TPD program, participants were respectful towards one another, held very positive views of online learning, and were open to multiculturalism while still maintaining their own cultural identity. The TPD program also promoted behavioral changes.

The tasks in the online TPD program were designed by the researchers and administered to participants while emphasizing gradual progression in the evolution of the forming relationships, starting with the initial introduction and concluding with in-depth familiarity. Two main tasks are presented below.

Acquaintance Through a Joint Presentation—A Sense of Place

This task was designed to take the familiarization process one step forward (subsequent to the two first tasks—*first acquaintance* and *true or false*). Each participant shared with the group the place that is most important in their life, inseparable from their identity, rooted in their own life story, and deeply connected with the experiences that shaped their lives.

Seventy-one participants responded, specifying their names. Although the task called for 3 posts, 39% of participants uploaded more than two posts. For example, T uploaded 8 posts, S, H, and A uploaded 5, and seven teachers each uploaded 4 posts.

We then examined the responses commenting on the various images and texts uploaded by participants. Several photos and descriptions are shown in Table 4 alongside the comments they generated from other participants.

Table 4

Number and Examples of Comments on the Images and Texts Uploaded by TPD Program Participants

Image	Image information	Number of comments	Comment examples
	I chose a photo taken at my grandmother and late grandfather's home. Since childhood, I spent a lot of time there. … taught me… about my Yemenite heritage….	6	Example 1: R, your photo and stories were touching… I had also spent much time at my grandfather's, and I have many cherished memories from their home… Example 2: I very much relate to it since I was also extremely close with my grandparents, and I have very fond memories from their home…
	For me, home is a family time-out. During summers, we love to spend time on the beach and enjoy our vacations and freedom.	6	Example 1: It's clear to see that you are very in tune with nature and possess a sense of peace and tranquility. Example 2: As a surfer, I relate very much. There is nothing like the beach to make one experience fun, feeling relaxed and recharged for the upcoming new week.

	I chose [a photo] of my home, specifically the room where we all gather. My life is my children…	6	I agree with every single word, a home is not just a physical space, but first and foremost, an emotional space.
	I feel free in Amsterdam everywhere in the city… I feel alive… Nobody is looking at me differently for having a Christian, Polish partner.	5	Example 1: H, I can understand why you choose to run so far just to feel normal. I wish one day we could live together and wholeheartedly accept the choices each person makes for themselves. Example 2: I totally understand why you find this feeling for Amsterdam because here, in Israel, people do not readily accept things that go against religion.
	A picture of the Kinneret (the Sea of Galilee)… I live in the Jordan Valley… I love the laid back, tranquil atmosphere. I feel like I'm on vacation all year round.	5	Example 1: …I have always kept a place in my heart for the great outdoors, and it's very touching to see it here… I am a city girl to the bone, but every time I see nature, my heart expands … Example 2: I love your picture because it reminds me of the times, I would go on trips in the outdoors as a child.

Table 4 suggests that where teachers shared photos with a special or personal message, they garnered more response. Also, content analysis of those responses indicates that 37% of teachers chose to refer to the teacher they responded to by their first name. This suggests a higher level of familiarity in interpersonal dialogue among teachers.

Conversation Between Two Participants

The following is an excerpt from a conversation between an Arab teacher and a Jewish teacher:

> Z (Arab male teacher in Elementary school): Our school participates in meetings… with a Jewish school…
>
> D (Jewish female teacher in Junior High school): … If we do it through education, we will only gain a healthier, better society and fewer problems [Arabs and Jews] … If you come to the central area with your family, you are welcome.
>
> Z: Thank you. You are also invited…

This passage is one of many, indicating the desire to live side by side, in neighborliness.

Last Task—Reflections

This task enabled us to examine whether the program participants were aware of the gradual progression of the tasks, what insights they may have acquired, and whether the design of the online environment had indeed contributed to forging connections between teachers from different backgrounds and sectors of Israeli society.

The following three quotations suggest that participants indeed noticed the gradual progression in task design, some expressly noting that this stepwise structure supported forging a connection and developing familiarization.

> I noticed that the program was gradually structured… Task by task, I progressively felt more comfortable writing about myself, exposing my feelings, especially in a Sense of Place"… (L, a female Jewish teacher in Elementary school).
>
> An important tool I acquired in the training program was the activities' structure and methodology, i.e., creating the entire familiarization process, from macro to micro… (A, a male Jewish teacher in High school).
>
> The program experience was like a funnel—from a superficial acquaintance of many people to a deeper familiarization with fewer participants, to very profoundly getting to know one particular participant (R, a male Jewish teacher in High school).

Such quotations suggest that the program's stepwise progression contributed to participants' growing motivation to get to know one another. Moreover, establishing the need for active participation, as we did when we asked participants to respond to and comment on the various contents uploaded by other participants, further contributed to forging connections.

> I found the possibility of reading my peers' comments very positive … I liked the fact that I could respond to their posts and see the responses of others to my own posts and those of other group members… (N, a female Jewish teacher in Elementary school).

> The tasks were challenging and we always had to comment or respond to our peers (more than one), which enabled more exposure and the opportunity to learn about ourselves and others (H, a female Jewish teacher in High school).

Alongside the many positive responses in the reflection portion, there were also a few negative responses.

> … I did not feel like the process was substantially profound… One idea would be to create tasks where we will be exposed to new technological tools that could render the physical distance entirely meaningless (D, a female Jewish teacher in Elementary school).

> It was uncomfortable for me when I was tasked with contacting one of my peers online… The interaction was superficial… I didn't really learn anything from this virtual connection (N, a female Jewish teacher in Elementary school).

Despite this, the majority of participants noted high comfort levels with regard to the online program.

> A substantial advantage was that I could carry out the course's tasks at my own leisure, thus requiring no preliminary preparation. I also had the opportunity to meet new people, in a manner that's new and unusual for me (R2, a female Jewish teacher in Elementary school).

Research Question 2

The second research question concerned whether and how technology reduces stereotypes and prejudices among teachers. We first present findings from the questionnaire, followed by findings from the various tasks undertaken by teachers in this program.

Initially, we looked at whether there were any changes in the research variables measured before and after the TPD program. To this end, we conducted dependent *t*-tests. Findings are presented in Table 5.

Table 5

Attitude Differences Before and After the TPD Program

Attitude	Before TPD program (n=85)		After TPD program (n=85)		
	M	*SD*	*M*	*SD*	*t*
Openness towards multiculturalism	4.09	0.60	4.37	0.58	4.41**
Cultural identity	3.49	0.87	3.72	1.01	2.28**
Acquaintance via online media	3.94	0.69	4.33	0.66	4.99**
Behavioral changes	2.46	0.91	2.75	0.87	3.01**

Note. $p < 0.01$**

This table demonstrates that despite initial high values in many variables, we still see a positive, significant change in all variables following participation in the training course: openness towards

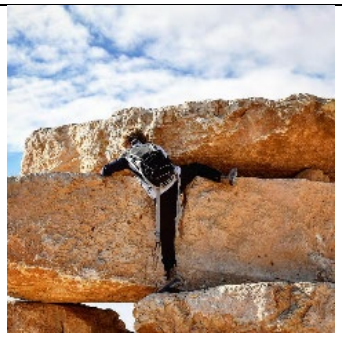
multiculturalism increased, but so did the participants' respective personal cultural identities. Their stance towards acquaintance via online media was improved, and positive changes were also noted in their behaviors (increased tolerance and acceptance of the "other").

The next step in our analysis aimed at understanding the reasons for the positive changes, examining whether such changes could be explained by any of the various tasks presented to the participants.

In the task "A Sense of Place", participants were asked to show one another photos that would enable peers to look for and identify various commonalities between people. These photos were categorized as shown in Table 6.

Table 6

Categories and Photos From the A Sense of a Place *Task*

Category	Photo
Trips	
Family	
Views	

Classes 

None of the participants chose to present photos with potential to cause discomfort. On the contrary, participants were looking for commonalities. Several participants repeated in their comments that there are points of common interest regardless of ethnicity (Arab/Jew) or religion (religious/secular). Therefore, it can be concluded that the participants related to each other as equals, without distinguishing among religion, race, or gender.

> I discovered that the majority of us share common goals… We are all educators and the exemplification of moral standards of parity and equality is a goal that [is shared] by us all (G, a female Jewish teacher in Elementary school).

> I learned how small the world really is and how many points of similarity there are between myself and my peers and professional colleagues (Y, a female Jewish teacher in Elementary school).

These quotations demonstrate that the program participants approached prejudice and preconceptions indirectly, looking for commonalities, both on the professional as well as the personal level.

However, some of the participants' comments referred directly to stereotypes and prejudice:

> The Internet is a space enabling equality where we can all truly participate and get to know one another, therefore, it is allowing us to build bridges and forego prejudice and stereotypes, truly getting to know one another (A2, a female Jewish teacher in Elementary school).

> Through online activity, interpersonal relationships can develop and we can get to know people who are different. Also, we can share our thoughts and feelings with others, inclusively accepting the other (S, a female Arab teacher in Elementary school).

Getting to know different types of people was important for many participants, as illustrated in the following quotations:

> Online encounters are a wonderful trigger for new acquaintances. Most of us have no real exposure to different [population] groups in our daily lives… (A, a male Jewish teacher in High school).

> The Internet is the only tool that could truly bring people of different and varied opinions together, and this is something we need to take with us. We all know that Israeli society is considered a broad-spectrum, multicultural society, which is why it's so important to have a tool like the Internet… (H, a female Arab teacher in Elementary school).

These quotations testify to the extent to which people from various backgrounds are eager to experience intercultural intersection. Technology provides people an opportunity to get to know others from diverse populations and backgrounds. Even just the exposure may reduce prejudice and conceptions concerning the different groups comprising Israeli society. This statement is further substantiated by participant D (A female Jewish teacher in Elementary school).

> I am very sorry for not having had the opportunity to be paired with a woman from a minority group… I was … looking forward to the opportunity to make real contact and get to know [someone different].

Discussion

This research presents a teachers' online TPD program carried out in Israel, a country which demonstrates significant cultural differences, stereotypes, and prejudices between groups (Walther et al., 2015). Research participants were teachers from diverse groups in Israeli society, participating in an online TPD program entitled The Israeli Society is Meeting Online. This TPD program encouraged online contact between participating teachers (Batson & Ahmad, 2009; Kim & Wojcieszak, 2018; Stathi & Crisp, 2008) in order to reduce stereotypes and prejudices. Although the parameters of direct and some forms of indirect contact are well established empirically, indirect online contact and its potential to improve intergroup relations have not yet been extensively investigated. Therefore, this study fills a gap in the research and demonstrates how online contact can be used to establish acquaintance and reduce stereotypes and prejudices among teachers from different groups in Israeli society.

The TPD program design was based on four conditions for optimal contact between groups (Allport, 1954):

1. Equal group status in the situation: The online environment created an equal starting point among participants. All participants were teachers, meaning they shared an equal professional identity.

2. Common goals: All teachers were interested in professional development in the field of intergroup relations.

3. Collaboration between groups: All tasks were based on collaboration between the participants.

4. Institutional support: The TPD program was supported by the Ministry of Education.

This research applied Allport's four conditions (1954) to an online environment and used computer-mediated communication (CMC) tools.

The research literature primarily addresses designing online environments for different goals (e.g., Brindley et al., 2009; Conceição, 2006). This research goes beyond and demonstrates how course design can develop and improve intergroup relations through online contact between groups. The course was designed to be a gradual series of meetings between teachers from different cultures in an online environment, in which participants would be enabled to meet, get to know each other, express more positive attitudes to one another, discover similarities, and show interest in face-to-face encounters.

In fact, the online contact in this program enabled *de-categorization*, in which participants referred to each other as individuals and not as representatives of their respective groups (Dovidio et al., 1997; Schellhaas & Dovidio, 2016). The de-categorization was established through the TPD program design that encouraged participants to communicate around their shared interests and backgrounds. The participants chose to introduce and discuss their similarities and connecting characteristics rather than discuss controversial factors that lead to separation.

During the online TPD program, the participants were encouraged to respond to each other regarding the materials they uploaded in order to create relations between the online discussions and social connections, as recommended by Hurt et al. (2012). Indeed, the tasks were designed to stimulate curiosity and discussion (such as in the task "A sense of place") which spurred a desire to deepen relationships.

The TPD program design enabled positive processes. Participants described their attitudes towards openness to multiculturalism and their cultural identities before and after the program. This study's findings highlight the process that enables participants to improve their acceptance of multiculturalism through intergroup online contact and to see each person as an individual, regardless of religion, race, or gender.

Interestingly, while the TPD program participants' openness to multiculturalism increased, their identification with their own cultural identities also increased. In other words, there was no contradiction between identity preservation and openness to multiculturalism. Some research has shown that personal identity is strengthened through encounters with others (Dovidio & Gaertner, 1999). This study expands that theory, demonstrating that openness to multiculturalism and personal identity can both be strengthened by meeting with others, even when using CMC for intergroup contact.

The positive online contact that participants underwent is unique, innovative, and not routine, because, in the context of the Israeli reality, interactions between different cultures are rare and the norm is rather intergroup separation, and high levels of tension, prejudice, stereotypes, and even hostility (Katz, 2013; Sabbagh & Resh, 2014). However, our findings indicate that acquaintance between teachers from different groups through online contact is possible, positive, and enables interpersonal changes, such as tolerance and containment that are so crucial to Israeli society.

Although teachers did not specifically discuss reducing stereotypes and prejudices toward the out-group, findings here are similar to those of Payne et al. (2010) who indicated that openness, a desire to know each other, and search for similarities are evidence of a reduction in stereotyping and prejudice and can be achieved through online contact. The teachers in this study expressed their desire to meet teachers from other groups in Israeli society and expressed positive attitudes towards them.

In summary, the current research makes both theoretical and practical contributions to the existing knowledge base. The theoretical contribution is connected to the use of CMC tools for intergroup contact between people in general and educators in particular to enhance acquaintance and reduce stereotypes and prejudice. Although the network has phenomena of homophily, racism, hatred, and stereotypes, it is possible to take advantage of remote familiarity with technological tools and to gain positive acquaintance through appropriate design. The practical contribution of this research refers to the ways to design TPD programs aimed at improving intergroup relations through online contact. In a COVID-19 world, where, on the one hand, there exists social distance and, on the other hand, there also exist

phenomena such as homophily and prejudice in online environments, this study has implications for society in general and the education system in particular. It is indeed possible to create social closeness from a distance between divided groups that do not usually meet or know much about each other. Teachers and professionals who undergo this type of program can serve as agents of change in society, at their workplaces, and in schools.

Limitations and Suggestions for Future Research

All teachers voluntarily chose to participate in the program and thus it may be inferred that they were sympathetic toward multiculturalism. Future studies should include "hesitant populations" or teachers who are more skeptical about the potential or even desirability of improving relations among rival groups. Also, the TPD program did not encourage teachers to deal with complex or controversial issues in Israeli society. The tasks encouraged participants to discuss mainly their commonalities. Therefore, it is recommended that a similar TPD program be designed and offered, with the added element of addressing controversial issues.

Lastly, the research was conducted in Israel and reflects the specific Israeli reality. Therefore, it is recommended that this research be undertaken in other diverse countries. Further research in this area is significantly needed, particularly in a COVID-19 world.

References

Aiello, L. M., Barrat, A., Schifanella, R., Cattuto, C., Markines, B., & Menczer, F. (2012). Friendship prediction and homophily in social media. *ACM Transactions on the Web*, *6*(2). http://doi.org/10.1145/2180861.2180866

Allport, G.W. (1954). *The nature of prejudice*. Addison-Wesley.

Amichai-Hamburger, Y. & McKenna, K. Y. A. (2006). The contact hypothesis reconsidered: Interacting via the Internet. *Journal of Computer-Mediated Communication*, *11*(3), 825-843. http://doi.org/10.1111/j.1083-6101.2006.00037.x

Amzalag, M., Elias, N., & Kali, Y. (2015). Adoption of online network tools by minority students: The case of students of Ethiopian origin in Israel. *Interdisciplinary Journal of e-Skills and Life Long Learning, 11,* 291-312. https://doi.org/10.28945/2321

Anderson, T., & Shattuck, J. (2012). Design-based research: A decade of progress in education research? *Educational researcher*, *41*(1), 16-25. https://doi.org/10.3102/0013189X11428813

Ariely, G. (2011). Globalization, immigration and national identity: How the level of globalization affects the relations between nationalism, constructive patriotism and attitudes toward immigrants? *Group Processes & Intergroup Relations*, *15*(4), 539-557. http://doi.org/10.1177/1368430211430518

Bar-On, D. (2008). *The others within us: Constructing Jewish-Israeli identity*. Cambridge University Press.

Batson, C. D., & Ahmad, N. Y. (2009). Using empathy to improve intergroup attitudes and relations. *Social Issues and Policy Review*, *3*(1), 141-177.

Bisgin, H., Agarwal, N., & Xu, X. (2010, August). Investigating homophily in online social networks. In *2010 IEEE/WIC/ACM International Conference on Web Intelligence and Intelligent Agent Technology* (Vol. 1, pp. 533-536). IEEE. http://doi.org/doi: 10.1109/WI-IAT.2010.61

Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology*, *3*(2), 77-101.

Brindley, J. E., Blaschke, L. M., & Walti, C. (2009). Creating effective collaborative learning groups in an online environment. *International Review of Research in Open and Distributed Learning*, *10*(3). https://doi.org/10.19173/irrodl.v10i3.675

Clarke, G. (2001). From ethnocide to ethnodevelopment? Ethnic minorities and Indigenous Peoples in Southeast Asia. *Third World Quarterly*, *22*(3), 413-436. http://doi.org/10.1080/01436590120061681

Cohen, A. (2018). Cultures within cultures in Israel: Jewish and Arab cultures and the work–family interface. In K.M. Shockley, W. Shen, & R.C. Johnson (Eds.), *The Cambridge handbook of the global work–family interface* (pp. 424-435). Cambridge University Press. https://doi.org/10.1017/9781108235556.023

Conceição, S. C. (2006). Faculty lived experiences in the online environment. *Adult Education Quarterly*, *57*(1), 26-45. http://doi.org/doi: 10.1177/1059601106292247

Creswell, J. W. (2013). *Research design: Qualitative, quantitative, and mixed methods approaches*. Sage.

Diaz, J., & Zirkel, S. (2012). Globalization, psychology, and social issues research: An introduction and conceptual framework. *Journal of Social Issues*, *68*(3), 439-453. http://doi.org/10.1111/j.1540-4560.2012.01757.x

Dovidio, J. F., & Gaertner, S. L. (1999). Reducing prejudice: Combating intergroup biases. *Current Directions in Psychological Science*, *8*(4), 101-105. https://www2.psych.ubc.ca/~schaller/308Readings/Dovidio1999.pdf

Dovidio, J. F., Gaertner, S. L., Validzic, A., Matoka, K., Johnson, B., & Frazier, S. (1997). Extending the benefits of recategorization: Evaluations, self-disclosure, and helping. *Journal of Experimental Social Psychology*, *33*(4), 401-420. https://doi.org/10.1006/jesp.1997.1327

Dunning, H., Williams, A., Abonyi, S., & Crooks, V. (2008). A mixed method approach to quality of life research: A case study approach. *Social Indicators Research*, *85*(1), 145-158. https://doi.org/10.1007/s11205-007-9131-5

Flick, U. (2004). Triangulation in qualitative research. In U. Flick, E. von Kardoff, & I. Steinke (Eds.), *A companion to qualitative research*, *3* (pp. 178-183). Sage.

Hasler, B. S. & Amichai-Hamburger, Y. (2013). Online intergroup contact. In Y. Amichai- Hamburger (Ed.), *The social net: Understanding our online behavior* (pp. 220-252). Oxford University Press.

Hofstra, B., Corten, R., van Tubergen, F., & Ellison, N. B. (2017). Sources of segregation in social networks: A novel approach using Facebook. *American Sociological Review, 82*(3), 625-656. https://doi.org/10.1177/0003122417705656

Holladay, C. L., Knight, J. L., Paige, D. L., & Quiñones, M. A. (2003). The influence of framing on attitudes toward diversity training. *Human Resource Development Quarterly*, *14*(3), 245-263. https://doi.org/10.1002/hrdq.1065

Hurt, N. E., Moss, G. S., Bradley, C. L., Larson, L. R., Lovelace, M., Prevost, L. B., ... & Camus, M. S. (2012). The" Facebook" Effect: College Students' Perceptions of Online Discussions in the Age of Social Networking. *International Journal for the Scholarship of Teaching and Learning*, *6*(2), n2. https://doi.org/10.20429/ijsotl.2012.060210

Katz, Y. (2013). The state approach to Jewish and non-Jewish education in Israel. In K. Watson & W.I. Ozanne (Eds.), *Education and religion: Global pressures, local responses* (pp. 325-338). Routledge. https://doi.org/10.1080/03050068.2010.503741

Kim, N., & Wojcieszak, M. (2018). Intergroup contact through online comments: Effects of direct and extended contact on outgroup attitudes. *Computers in Human Behavior*, *81*, 63-72. https://doi.org/10.1016/j.chb.2017.11.013

Kinnvall, C., & Lindén, J. (2010). Dialogical selves between security and insecurity: Migration, multiculturalism, and the challenge of the global. *Theory & Psychology*, *20*(5), 595-619. http://doi.org/10.1177/0959354309360077

Laron, D., & Lev Ari, L. (2013). "There is something here that makes it possible": Jewish and other students in the master's degree programs at Oranim College. *Dvarim, 6*, 99-116.

Lev-On, A., & Lissitsa, S. (2015). Studying the coevolution of social distance, offline- and online contacts. *Computers in Human Behavior*, *48*, 448-456. https://doi.org/10.1016/j.chb.2015.02.009

Maruyama, G., Moreno, J. F., Gudeman, R. H., & Marin, P. (2000). *Does diversity make a difference? Three research studies on diversity in college classrooms* (ED444409). ERIC. https://files.eric.ed.gov/fulltext/ED444409.pdf

McPherson, M., Smith-Lovin, L., & Cook, J. M. (2001). Birds of a feather: Homophily in social networks. *Annual Review of Sociology*, *27*(1), 415-444.

Paluck, E. L. (2009). Reducing intergroup prejudice and conflict using the media: A field experiment in Rwanda. *Journal of Personality and Social Psychology*, *96*(3), 574-587. https://doi.org/10.1037/a0011989

Patsiurko, N., Campbell, J. L., & Hall, J. A. (2012). Measuring cultural diversity: Ethnic, linguistic and religious fractionalization in the OECD. *Ethnic and Racial Studies*, *35*(2), 195-217. http://doi.org/10.1080/01419870.2011.579136

Patton, M. Q. (2002). *Qualitative research and evaluation methods* (3rd ed.). Sage.

Payne, B. K., Krosnick, J. A., Pasek, J., Lelkes, Y., Akhtar, O., & Tompson, T. (2010). Implicit and explicit prejudice in the 2008 American presidential election. *Journal of Experimental Social Psychology*, *46*(2), 367-374. https://doi.org/10.1016/j.jesp.2009.11.001

Pettigrew, T. F., & Tropp, L. R. (2006). A meta-analytic test of intergroup contact theory. *Journal of Personality and Social Psychology*, *90*(5), 751-783. https://doi.org/10.1037/0022-3514.90.5.751

Pettigrew, T. F., & Tropp, L. R. (2008). How does intergroup contact reduce prejudice? Meta-analytic tests of three mediators. *European Journal of Social Psychology*, *38*(6), 922-934.

Pohan, C. A., & Aguilar, T. E. (2001). Measuring educators' beliefs about diversity in personal and professional contexts. *American Educational Research Journal*, *38*(1), 159-182. https://doi.org/10.3102/00028312038001159

Rew, L., Becker, H., Cookston, J., Khosropour, S., & Martinez, S. (2003). Measuring cultural awareness in nursing students. *Journal of Nursing Education*, *42*(6), 249-257.

Rodriguez, N. P. (2003). The real "New World Order": The globalization of racial and ethnic relations in the late twentieth century. In M.C. Guttman, F.V. Matos Rodriguez, L. Stephen, & P. Zavella (Eds.), *Perspectives on Las Américas: A reader in culture, history, and representation* (pp. 81-89). Blackwell Publishers. https://doi.org/10.1002/9780470753538.ch5

Sabbagh, C., & Resh, N. (2014). Citizenship orientations in a divided society: A comparison of three groups of Israeli junior-high students—secular Jews, religious Jews, and Israeli Arabs. *Education, Citizenship and Social Justice*, *9*(1), 34-54. http://doi.org/10.1177/1746197913497662

Schellhaas, F. M., & Dovidio, J. F. (2016). Improving intergroup relations. *Current Opinion in Psychology*, *11*, 10-14. https://doi.org/10.1016/j.copsyc.2016.04.002

Shapira, N., Kupermintz, H., & Kali, Y. (2016). Design principles for promoting intergroup empathy in online environments. *Interdisciplinary Journal of e-Skills and Life Long Learning*, 12, 225-246. http://www.informingscience.org/Publications/3605

Shapira, N., Kali, Y., Kupermintz, H., & Dolev, N. (2020). Utilizing television sitcom to foster intergroup empathy among Israeli teachers. *International Journal of Multicultural Education, 22*(3), 1-23. http://dx.doi.org/10.18251/ijme.v22i3.2225

Stathi, S., & Crisp, R. J. (2008). Imagining intergroup contact promotes projection to outgroups. *Journal of Experimental Social Psychology*, *44*(4), 943-957. https://doi.org/10.1016/j.jesp.2008.02.003

Steinberg, S., & Bar-On, D. (2002). An analysis of the group process in encounters between Jews and Palestinians using a typology for discourse classification. *International Journal of Intercultural Relations*, *26*(2), 199-214. https://doi.org/10.1016/S0147-1767(01)00047-5

Tam, T., Hewstone, M., Kenworthy, J. B., Cairns, E., Marinetti, C., Geddes, L., & Parkinson, B. (2008). Post conflict reconciliation: Intergroup forgiveness and implicit biases in Northern Ireland. *Journal of Social Issues*, *64*(2), 303-320. http://doi.org/10.1111/j.1540-4560.2008.00563.x

Van Cott, D. L. (2005). Building inclusive democracies: Indigenous peoples and ethnic minorities in Latin America. *Democratization*, *12*(5), 820-837. http://doi.org/10.1080/13510340500322215

Walther, J. B., Hoter, E., Ganayem, A., & Shonfeld, M. (2015). Computer-mediated communication and the reduction of prejudice: A controlled longitudinal field experiment among Jews and Arabs in Israel. *Computers in Human Behavior*, *52*, 550-558. https://doi.org/10.1016/j.chb.2014.08.004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First-Generation Students in Distance Education Program: Family Resources and Academic Outcomes

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Abstract

Distance education students have less access to classmates as a social resource and may, therefore, rely more on family members for support. However, first-generation students, or students who are the first in their family to attend university, may lack the academic resources that family members can provide. Overall, first-generation students in distance education programs may be at particular risk of lacking the necessary social capital to thrive in university. This study investigated whether two family resource variables—providing guidance about university and expressing supportive attitudes toward university—varied across generation status among distance education students. The study also investigated whether these family resource variables predicted students' academic adjustment and academic persistence. A sample of 224 undergraduate, distance education students in South Africa completed an online survey. First-generation students (n = 60) reported receiving less university guidance from family members compared to continuing-generation students. In addition, receiving university guidance predicted students' academic adjustment. The results suggest that university guidance from family members may serve as a protective factor against potential challenges that can impact students' academic adjustment, a protective factor that first-generation students are less likely to have.

Keywords: first-generation students, distance education, social capital, academic adjustment, academic persistence

Introduction

Distance education has enabled academic institutions to offer programs to an increasing number of students. The ease of access and convenience that distance education affords (e.g., students are not required to move away from family or employment to attend university) allows students to enrol who would not otherwise be able to do so (Hart, 2012; Jaggars, 2014; Qayyum & Zawacki-Richter, 2019; Willging & Johnson, 2009). One population of students, in particular, may have benefited from the access that distance education provides: first-generation students who are the first in their family to attend university.

However, while distance education programs may increase access, first-generation students may have poorer academic experiences and outcomes compared to their continuing-generation peers. Research on traditional, classroom-based university students has found that first-generation students have a harder time understanding university culture, understanding faculty expectations, and believing in their own academic abilities (Collier & Morgan, 2008; Ishitani, 2003; Metcalf & Wiener, 2018; Pascarella, Pierson et al., 2004; Stephens et al., 2012). These problems may be exacerbated in distance education programs, where there are higher dropout rates, in general, compared to classroom-based programs (Simpson, 2013).

One explanation for poor academic outcomes among first-generation students is that they have less social capital to draw upon when engaging in the university environment compared to other students (e.g., Collier & Morgan, 2008; Wainwright & Watts, 2021). Notwithstanding the importance of university staff, for undergraduate students, social capital can include family members and university friends and classmates who possess knowledge about university life or who can simply provide moral support and encouragement. Indeed, research on classroom-based university students has found that they view both family members and university classmates as valuable sources of social support for dealing with the uncertainties and challenges of university life (El-Ghoroury et al., 2012; Pillay & Ngcobo, 2010).

Although family and friends can both be social resources, some studies on classroom-based university students have found that support from classmates was a stronger predictor of academic outcomes (Dennis et al., 2005; Friedlander et al., 2007). In distance education, however, access to university classmates is more limited, and feeling isolated and removed from one's classmates is one of the reasons why students in distance education drop out of programs (Hart, 2012; Mittelmeier et al., 2019; Willging & Johnson, 2009). With more limited social support from classmates, distance education students may benefit more from family members as a social resource. However, since the parents of first-generation students do not have university experiences to draw upon, the extent of their support may also be limited.

The present study compared the family resources of first-generation and continuing-generation students in distance education programs. The study also analyzed whether these family resources predicted academic outcomes. Two family resource variables were considered: university guidance, which addresses whether family members can provide the student specific advice regarding university matters; and supportive attitudes, which pertains to whether family members support the student's pursuit of higher education. The academic outcome variables considered were the student's academic adjustment, in terms of keeping up with the demands of academic tasks and performing them well

(Feldt et al., 2011); and academic persistence, in terms of the intent to continue studying in a chosen program and to complete the degree (Pascarella & Terenzini, 1980).

Family members can be a source of social capital if they can offer advice or answer specific questions about the university context. Unfortunately, when a student's family members have not attended university themselves, they may lack understanding of the university context and be less able to provide guidance. Priebe et al.'s (2008) qualitative study of first-generation students found that the parents may have difficulty offering guidance on university matters, such as completing applications, selecting programs, and obtaining financial aid. The present study used a quantitative approach to compare the level of university guidance first-generation students and continuing-generation students received from family members. The authors anticipated that first-generation students would report having received less university guidance from family members compared to continuing-generation students.

Family members can also be a social resource more generally, by expressing positive and affirmative attitudes about the student's pursuit of higher education. Research findings on first-generation students in this regard are somewhat mixed. On the one hand, in several qualitative studies, first-generation students reported receiving positive messages from their parents regarding education, in general, along with the pursuit of higher education, in particular. These messages included valuing education from elementary school onward, encouraging the pursuit of higher degrees, and expressing pride about the student's academic pursuits and achievements (Gofen, 2009; Hebert, 2018; Irlbeck, Adams et al., 2014). On the other hand, in some studies, first-generation students reported receiving discouraging messages from their parents, including not expecting that the student would enrol in university, valuing a focus on family instead of academic pursuits, or considering a university degree devoid of value or practical purpose (Priebe et al., 2008). It was, therefore, unclear at the outset of the study whether the attitudes of first-generation students' family members would be less or more supportive or the same as the attitudes of continuing-generation students' family members.

The present study further investigated whether family members' university guidance and supportive attitudes would predict the academic adjustment and academic persistence of distance education students. Prior research has touched upon the relationship between family resources and academic outcomes. For example, research on both distance education students and classroom-based students found that general family support (e.g., "my family cares about me") correlated with academic adjustment (Rodriguez et al., 2017) as well as academic persistence (Ceglie & Settlage, 2016; Park & Choi, 2009). However, these studies did not determine whether specific types of family support (i.e., university guidance and supportive attitudes about university, in particular) correlated with these outcomes. Additional research on classroom-based students found that university guidance and supportive attitudes about university were both related to academic factors, such as higher enrolment, reduced college stress, and reduced loneliness (Dorrance Hall, et al., 2017; Gofen, 2009; Hebert, 2018; Irlbeck et al., 2014). Yet, these studies did not specifically consider academic adjustment and academic persistence, and did not focus on distance education students.

The authors anticipated that university guidance, which includes advice about navigating university environments, would be a stronger predictor of academic adjustment, compared to supportive attitudes. They also anticipated that supportive attitudes, which include the affirmation of academic pursuits, would be a stronger predictor of academic persistence, compared to university guidance.

Methods

Study Participants and Procedures

Undergraduate students at a distance education university in South Africa voluntarily participated in the study and completed a survey questionnaire online. An online description of the study was read by 376 students. Of these students, 224 students completed the study survey. The final sample comprised 54% female and 46% male students, who ranged in age from 19-years-old to 59-years-old (M = 33.70, SD = 9.00). Based on the racial categories currently used in South Africa, 52% of the participants were Black, 32% White, 9% Coloured, and 7% Indian. Most of the students regarded themselves as middle class. 18% of the students regarded themselves as lower-middle class, 29% as middle class, 14% as upper-middle class; and 29% of the students regarded themselves as working class, 9% as poor, and 1% as wealthy.

The students were enrolled in the faculties of human sciences (25%), law (20%), agriculture and environmental sciences (13%), economics and management sciences (13%), science, engineering, and technology (13%), accounting (8%), and education (8%). 41% of the participants were in their 1st year of university, 19% were in their 2nd year, 26% were in their 3rd year, and 14% were in their 4th year. Data collection occurred at the beginning of the second semester of the academic year. Ethical approval for the study was granted by an institutional review board at the University of South Africa.

Survey Measures

Generation Status

Participants were asked to respond "yes" or "no" to a number of statements to determine whether their family members attended/graduated from university. The survey items were "I have a primary caretaker (i.e., a person who looked after me when growing up) who attended university but did not graduate," "I have a primary caretaker (i.e., a person who looked after me when growing up) who graduated from university," "I have a family member (i.e., a person other than a caretaker) who attended university but did not graduate," and "I have a family member (i.e., a person other than a caretaker) who graduated from university." Based on their responses, participants were assigned a generation status group, as follows,

- If a participant had a primary caretaker who graduated from university, they were assigned to the caretaker-graduated group.
- If a participant had a non-caretaker family member who graduated from university, they were assigned to the non-caretaker-graduated group.
- If a participant had a caretaker who attended university but did not graduate, they were assigned to the caretaker-attended group.
- If a participant had a non-caretaker family member who attended university but did not graduate, they were assigned to the non-caretaker-attended group.
- If a participant chose "no" in response to all of the generation status items, they were assigned to the first-generation group.

Close to a third of the participants (27%, n = 60) were first-generation students; 42% (n = 94) of students were in the non-caretaker-graduated group, 26% (n = 58) were in the caretaker-graduated group, 3% (n = 7) were in the caretaker-attended group, and 2% (n = 5) were in the non-caretaker-attended group. Since a very small number of participants were in the caretaker-attended and the non-caretaker-attended groups, these groups were not included in the analyses. Therefore, the analyses began with three generation status groups: first-generation, non-caretaker-graduated, and caretaker-graduated groups.

University Guidance

Guidance from family members about university was measured using four items: "I have a family member who gives me advice about university," "I have a family member who can answer questions that I have about university," "I have a family member who helps me with the challenges of university life," "My family is a valuable resource for me to talk to about university." Responses were provided on a 5-point Likert scale that ranged from "strongly disagree" to "strongly agree." Cronbach's alpha for the scale was .93.

Supportive Attitudes

Family attitudes about pursuing a university degree were measured using four items: "In general, my family supports the idea of me going to university," "In general, my family is proud that I am going to university," "In general, my family wants me to graduate from university," and "I can easily talk to my family about university life." Responses were provided on a 5-point Likert scale that ranged from "strongly disagree" to "strongly agree." Cronbach's alpha for the scale was .90.

Academic Adjustment

Adjustment to the academic tasks and responsibilities of a university education were measured using five items: "I have been keeping up to date on my academic work," "I prepare for my assignments regularly," "I really feel I am using my time well in university," "I am satisfied with the level at which I am performing academically," and "I am enjoying my academic work at university." Responses were provided on a 5-point Likert scale that ranged from "strongly disagree" to "strongly agree." Cronbach's alpha for the scale was .83.

Academic Persistence

The academic persistence of the students was measured using three items: "I intend to continue studying in my field," "I intend to get a Bachelor's degree in my field of study," and "I am sure that I want to continue with my education in my current field of study." Responses were provided on a 5-point Likert scale that ranged from "strongly disagree" to "strongly agree." Cronbach's alpha for the scale was .80.

Data Analyses

Data analyses were conducted using structural equation modelling (SEM) to test the study hypotheses. Regarding generation status and family resources, the authors anticipated that first-generation students would report less university guidance compared to continuing-generation students, while no hypothesis was made regarding generation status and family attitudes. Regarding family resources and academic outcomes, the authors anticipated that university guidance would be a stronger predictor of academic adjustment than would supportive attitudes, while supportive attitudes would be a stronger predictor of academic persistence than would university guidance.

Within the path model, generation status served as an independent variable, the two family resource variables served as mediators, and the two academic outcomes served as outcome variables. However, since generation status was measured using an ordinal scale, the use of dummy variables would have been required within the model. Preliminary analyses were, therefore, conducted to determine whether any of the generation status categories could be combined.

Preliminary Analyses

A one-way analysis of variance (ANOVA) was conducted for each family resource variable, with generation status as the independent variable. Results show a significant difference between generation status categories for university guidance, $F(2, 226) = 17.93$, $p < .001$, but not for supportive attitudes $F(2, 226) = 0.86$, $p = .425$. A Tukey post-hoc test was conducted to determine how university guidance varied across the generation status categories. Results show that university guidance was significantly lower for the first-generation group ($M = 2.37$, $SD = 1.24$) compared to the non-caretaker-graduated group ($M = 3.30$, $SD = 1.40$, $p < .001$) and the caretaker-graduated group ($M = 3.73$, $SD = 1.24$, $p < .001$). The difference between the non-caretaker-graduated group and the caretaker-graduated group was not significant ($p = .097$).

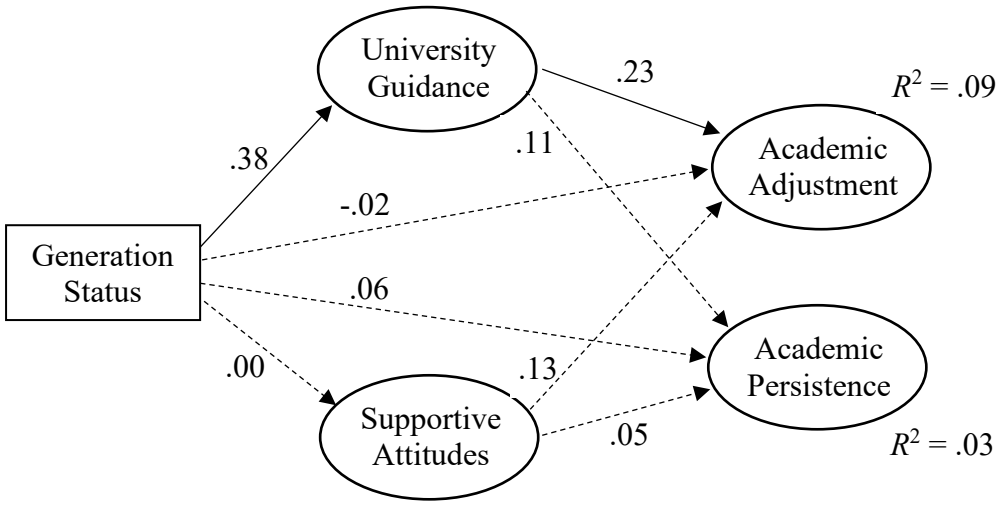
Overall, no differences were found between the non-caretaker-graduated group and the caretaker-graduated group regarding both family resource variables. In addition, the non-caretaker-graduated group and the caretaker-graduated group are conceptually similar in that they both refer to having a family member who graduated from university. Therefore, in order to simplify the SEM, the non-caretaker-graduated group and the caretaker-graduated group were combined, making the generation status variable a dichotomous variable, labelled as first-generation students and continuing-generation students. Descriptive statistics were used to present the results of the SEM.

Results

Results of the SEM conducted to test the proposed relationships between family resources and academic outcomes are presented Figure 1 and Table 1. The model had adequate fit, $\chi^2(122) = 259.92$, $p < .001$, comparative fit index (CFI) = .94, root-mean-square error of approximation (RMSEA) = .07, and standardized root-mean-square residual (SRMR) = .06.

Figure 1

Structural Equation Model (SEM) of Family Resources and Academic Outcomes



Note. The measurement model was excluded to improve clarity. Solid lines represent significant paths ($p < .05$). Path coefficients are standardized. Generation status was coded as 0 for first-generation and 1 for continuing-generation. Multiple correlation squared (R^2) = explained variance.

Table 1

Means, Standard Deviations, and Correlations of Family Resources and Academic Outcomes

	Variable	*M* (*SD*)	1	2	3	4
1.	Generation status	-				
2.	Supportive attitudes	4.63 (.71)	.00			
3.	University guidance	3.17 (1.41)	.36*	.43*		
4.	Academic adjustment	4.13 (.77)	.12	.21*	.30*	
5.	Academic persistence	4.63 (.73)	.07	.13*	.11	.33*

Note. Generation status was coded as 0 for first-generation and 1 for continuing-generation.

*$p < .05$.

Results show that, as expected, generation status predicted university guidance: First-generation students received less guidance from family members than continuing-generation students. In addition, for distance education students in general, university guidance predicted academic adjustment. Overall, the predictor variables in the model accounted for 9% of the variance in academic adjustment. Generation status did not predict family members' supportive attitudes. However, a hypothesis

regarding supportive attitudes had not been established a priori, as results from previous qualitative studies were mixed: some first-generation students reported that family members' attitudes were supportive while others reported that that family members' attitudes were discouraging (Gofen, 2009; Hebert, 2018; Irlbeck et al., 2014; Priebe et al., 2008). In this study, supportive attitudes were quantitively compared between first-generation students and continuing-generation students, and a significant difference was not found between the student groups. Finally, despite expectations that supportive attitudes, in particular, would predict academic persistence, findings show that none of the variables were significant predictors of academic persistence.

Considering that generation status predicted university guidance and university guidance predicted academic adjustment, a significant test of the indirect effect was conducted. The test revealed a significant indirect effect between generation status and academic adjustment, mediated by university guidance. The unstandardized indirect effect was .13 and standard effect (*SE*) = .06, $p = .017$. All other indirect effects were also tested but were not significant ($p > .100$).

Discussion

Social capital can be an important resource for undergraduate students to succeed within the university context. For distance education students, who have less access to classmates, family members can become particularly valuable. However, distance education students who are also first-generation students may lack this resource as well. The present study explored whether the university guidance of family members and their supportive attitudes toward higher education varied across generation status. The study also considered whether these family resources predicted the academic adjustment and academic persistence of distance education students.

Results show that first-generation students received less university guidance from family members compared to continuing-generation students. Furthermore, for distance education student in general, university guidance was a significant predictor of academic adjustment though not of academic persistence. As such, first-generation students were less likely to receive university guidance from family members, potentially limiting their academic adjustment. However, since the relationship between university guidance and academic adjustment was tested using a correlational design, causality cannot be determined. Not all undergraduate students necessarily rely on family members for advice or need family members to help them adjust to university (Friedlander et al., 2007). However, the indirect effect of generation status on academic adjustment, mediated by university guidance, indicates that the university experience of family members can be a resource for distance education students.

University guidance from family members may serve as a protective factor that distance education students can rely on when experiencing academic difficulties; however, the results show that first-generation students tend to lack the protective element that university guidance affords. Future research is needed to investigate the conditions in which students seek university guidance and how this guidance assists in academic adjustment. Further research should specifically explore whether university guidance primarily operates as a protective factor against certain risks, and if so, in what scenarios and for whom (see Luthar et al., 2000; Makoe & Nsamba, 2019).

The study found that the supportive attitudes of family members did not vary across generation status. Although, as previous studies have shown, some first-generation students experience negative attitudes from family members about higher education (e.g., Priebe et al., 2008), such attitudes did not occur to a greater extent among first-generation students compared to continuing-generation students. As such, the supportive attitudes available to first-generation students are not necessarily different from those available to continuing-generation students. However, participation in the present study was limited to students enrolled in a specific university. Individuals who are not enrolled in a university but are considering enrolment, and would be the first in their family to do so, may have family members who are less supportive of higher education. Furthermore, previously-enrolled students who dropped out of their program may also have family members who hold less supportive attitudes and may be more likely to be first-generation students. Among students who are enrolled in a university, the study found no differences in the supportive attitudes of family members across generation status. In addition, the study found that supportive attitudes were not a significant predictor of either academic adjustment or academic persistence.

Regarding the potential relationships between generation status and the other four variables in the model, only one relationship was statistically significant: the relationship between generation status and university guidance (although there was also a significant indirect effect of generation status on academic adjustment). This finding is consistent with prior research that found that first-generation students sometimes have poorer academic outcomes than other students but only in certain domains, with effect sizes that are often small (see Pascarella et al., 2004). However, additional research is needed to further identify the deficits of first-generation students in distance education programs (e.g., absence of certain protective factors, such as university guidance) and determine how these deficits impact academic outcomes.

Knowing the unique circumstances of first-generation students can inform the development of resources for distance education that would be particularly beneficial for first-generation students. For example, first-generation students may benefit from university-level social resources that they can rely on when they experience university-related challenges (e.g., Kara & Can, 2019). Distance education universities could develop student-based social platforms through which students could receive advice about university. While such forums often exist for individual courses, they could also be developed and managed at the university level. Instead of posting questions about course content, students could post questions about university life in general (e.g., time management), to be answered by other students or by university staff.

Finally, the non-significant difference in university guidance available to students in the caretaker-graduated group and the students in the non-caretaker-graduated group (see *Preliminary Analyses*) requires consideration. While, both groups could be regarded as continuing-generation groups, because they both reference a family member who graduated from university, it is possible that students in the caretaker-graduated group reported a higher degree of university guidance compared to those in the non-caretaker-graduated group. This possibility is based on the assumption that students could receive more advice from their parents or primary caretakers than from extended family members. However, this assumption may not be true in all cultural contexts. For example, Mylonas and colleagues (2001) found that while the level of communication with parents is relatively stable across cultures, the level of communication with extended family members is more varied; it can range from being somewhat low in some cultures to being comparable to primary caretakers in others.

The present study took place in South Africa where no significant difference was found in university guidance between the caretaker-graduated group and the non-caretaker-graduated group. However, differences between these two groups may exist in other cultures, where extended family members play a smaller role in offering guidance compared to primary caretakers. Additional research should be conducted to determine how cultural factors influence the availability of family resources, focusing on nuclear and extended families, in order to develop a more nuanced conceptualization of first-generation status.

In conclusion, distance education is expanding and more students are the first in their families to attend higher education. Unfortunately, distance education programs have lower graduation rates compared to traditional, classroom-based programs; and first-generation students have poorer academic outcomes compared to continuing-generation students. Further research is needed to better understand the experiences of first-generation students in distance education programs. This study found that first-generation students receive less university guidance from family members than continuing-generation students, which may have negative impact on how well distance education students adjust to the academic demands of an undergraduate degree.

References

Ceglie, R. J., & Settlage, J. (2016). College student persistence in scientific disciplines: Cultural and social capital as contributing factors. *International Journal of Science and Mathematics Education*, *14*, 169–186. https://doi.org/10.1007/s10763-014-9592-3

Collier, P. J., & Morgan, D. L. (2008). "Is that paper really due today?": Differences in first-generation and traditional college students' understandings of faculty expectations. *Higher Education*, *55*, 425–446. https://doi.org/10.1007/s10734-007-9065-5

Dennis, J. M., Phinney, J. S., & Chuateco, L. I. (2005). The role of motivation, parental support, and peer support in the academic success of ethnic minority first-generation college students. *Journal of College Student Development*, *46*(3), 223–236. https://doi.org/10.1353/csd.2005.0023

Dorrance Hall, E., McNallie, J., Custers, K., Timmermans, E., Wilson, S. R., & Van den Bulck, J. (2017). A cross-cultural examination of the mediating role of family support and parental advice quality on the relationship between family communication patterns and first-year college student adjustment in the United States and Belgium. *Communication Research*, *44*(5), 638–667. https://doi.org/10.1177/0093650216657755

El-Ghoroury, N. H., Galper, D. I., Sawaqdeh, A., & Bufka, L. F. (2012). Stress, coping, and barriers to wellness among psychology graduate students. *Training and Education in Professional Psychology*, *6*(2), 122–134. https://doi.org/10.1037/a0028768

Feldt, R. C., Graham, M., & Dew, D. (2011). Measuring adjustment to college: Construct validity of the student adaptation to college questionnaire. *Measurement and Evaluation in Counseling and Development*, *44*(2), 92–104. https://doi.org/10.1177/0748175611400291

Friedlander, L. J., Reid, G. J., Shupak, N., & Cribbie, R. (2007). Social support, self-esteem, and stress as predictors of adjustment to university among first-year undergraduates. *Journal of College Student Development*, *48*(3), 259–274. https://doi.org/10.1353/csd.2007.0024

Gofen, A. (2009). Family capital: How first-generation higher education students break the intergenerational cycle. *Family Relations: Interdisciplinary Journal of Applied Family Science*, *58*(1), 104–120. https://doi.org/10.1111/j.1741-3729.2008.00538.x

Hart, C. (2012). Factors associated with student persistence in an online program of study: A review of the literature. *Journal of Interactive Online Learning*, *11*(1), 19–42. Retrieved from https://www.ncolr.org/jiol/issues/pdf/11.1.2.pdf

Hebert, T. P. (2018). An examination of high-achieving first-generation college students from low-income backgrounds. *Gifted Child Quarterly*, *62*(1), 96–110. https://doi.org/10.1177/0016986217738051

Irlbeck, E., Adams, S., Akers, C., Burris, S., & Jones, S. (2014). First generation college students: Motivations and support systems. *Journal of Agricultural Education*, *55*(2), 154–166. https://doi.org/10.5032/jae.2014.02154

Ishitani, T. T. (2003). A longitudinal approach to assessing attrition behaviour among first-generation students: Time-varying effects of pre-college characteristics. *Research in Higher Education*, *44*, 433–449. https://doi.org/10.1023/A:1024284932709

Jaggars, S. S. (2014). Choosing between online and face-to-face courses: Community college student voices. *American Journal of Distance Education*, *28*(1), 27–38. https://doi.org/10.1080/08923647.2014.867697

Kara, M., & Can, G. (2019). Master's students' perceptions and expectations of good tutors and advisors in distance education. *The International Review of Research in Open and Distributed Learning*, *20*(2), 162–179. https://doi.org/10.19173/irrodl.v20i2.3674

Luthar, S. S., Cicchetti, D., & Becker, B. (2000). The construct of resilience: A critical evaluation and guidelines for future work. *Child Development*, *71*(3), 543–562. https://doi.org/10.1111/1467-8624.00164

Makoe, M., & Nsamba, A. (2019). The gap between student perceptions and expectations of quality support services at the University of South Africa. *American Journal of Distance Education*, *33*(2), 132–141. /https://doi.org/10.1080/08923647.2019.1583028,

Metcalf, D. A., & Wiener, K. K. K. (2018). Academic self-efficacy in a 21st-century Australian university: Strategies for first-generation students. *Higher Education Research & Development*, *37*(7), 1472–1488. https://doi.org/10.1080/07294360.2018.1484705

Mittelmeier, J., Rogaten, J., Sachikonye, M., Gunter, A., Prinsloo, P., & Rienties, B. (2019). Understanding the adjustment of first-year distance education students in South Africa: Factors that impact students' experiences. *The International Review of Research in Open and Distributed Learning*, *20*(3), 18–38. https://doi.org/10.19173/irrodl.v20i4.4101

Mylonas, K., Bafiti, T., Poortinga, Y. H., Christakopoulou, S., Kagitcibasi, C., Kwak, K., Ataca, B., Berry, J., Orung, S., Sunar, D., Charalambous, N., Goodwin, R., Wang, W. Z., Angleitner, A., Stepanikova, I., Pick, S., Givaudan, M., Zhuravliova-Gionis, I., Konantambigi, R., Gelfand, M. J., Marinova, V., McBride-Chang, C., and Kodic, Y. (2001). Functional relationships in the nuclear and extended family: A 16-culture study. *International Journal of Psychology*, *36*(5), 289–300. https://doi.org/10.1080/00207590143000045

Park, J., & Choi, H. J. (2009). Factors influencing adult learners' decision to drop out or persist in online learning. *Educational Technology & Society*, *12*(4), 207–217. Retrieved from https://www.jstor.org/stable/10.2307/jeductechsoci.12.4.207

Pascarella, E. T., Pierson, C. T., Wolniak, G. C., & Terenzini, P. T. (2004). First-generation college students: Additional evidence on college experiences and outcomes. *The Journal of Higher Education*, *75*(3), 249–284. https://doi.org/10.1080/00221546.2004.11772256

Pascarella, E. T., & Terenzini, P. T. (1980). Predicting freshman persistence and voluntary dropout decisions from a theoretical model. *Journal of Higher Education*, *51*(1), 60–75. https://doi.org/10.2307/1981125

Pillay, A. L., & Ngcobo, H. S. B. (2010). Sources of stress and support among rural-based first-year university students: An exploratory study. *South African Journal of Psychology*, *40*(3), 234–240. https://doi.org/10.1177/008124631004000302

Priebe, L. C., Ross, T. L., & Low, K. W. (2008). Exploring the role of distance education in fostering equitable university access for first generation students: A phenomenological survey. *The International Review of Research in Open and Distance Learning*, *9*(1), 1–12. https://doi.org/10.19173/irrodl.v9i1.452

Qayyum, A., & Zawacki-Richter, O. (2019). The state of open and distance education. In O. Zawacki-Richter, & A. Qayyum (Eds.), *Open and distance education in Asia, Africa and the Middle East* (pp. 125–140). Springer. https://doi.org/10.1007/978-981-13-5787-9_14

Rodriguez, M. S., Tinajero, C., & Paramo, M. F. (2017). Pre-entry characteristics, perceived social support, adjustment and academic achievement in first-year Spanish university students: A path model. *Journal of Psychology*, *151*(8), 722–738. https://doi.org/10.1080/00223980.2017.1372351

Simpson, O. (2013). Student retention in distance education: Are we failing our students? *Open Learning*, *28*(2), 105–119. https://doi.org/10.1080/02680513.2013.847363

Stephens, N. M., Fryberg, S. A., Markus, H. R., Johnson, C. S., & Covarrubias, R. (2012). Unseen disadvantage: How American universities' focus on independence undermines the academic performance of first-generation college students. *Journal of Personality and Social Psychology*, *102*(6), 1178–1197. https://doi.org/10.1037/a0027143

Wainwright, E., & Watts, M. (2021). Social mobility in the slipstream: First-generation students' narratives of university participation and family. *Educational Review, 73*(1), 111–127. Advance online publication. https://doi.org/10.1080/00131911.2019.1566209

Willging, P. A., & Johnson, S. D. (2009). Factors that influence students' decision to drop-out of online courses. *Journal of Asynchronous Learning Networks*, *13*(3), 115–127. http://dx.doi.org/10.24059/olj.v13i3.1659

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Empirical Analysis of Return to Distance Higher Education in Different Disciplines

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Abstract

Few empirical studies have analyzed the return to distance higher education in different academic disciplines. This study used quantitative methods, data from a nationwide survey, and Mincerian earnings function to analyze the return to distance higher education among different disciplines in China's labor market. Results were compared with the return to face-to-face higher education and showed that the returns to face-to-face higher education were higher than those to distance higher education. Returns to the disciplines of economics and management were at a high level in both face-to-face and distance education; returns to the disciplines of literature, as well as education and law, were at a low level in both face-to-face and distance education. The returns to the disciplines of science and engineering were higher in face-to-face education than in distance education. This paper proposes several recommendations. Adults who do not have higher education degrees should invest in distance higher education to obtain considerable monetary returns, particularly in the disciplines with higher returns such as management and economics. China's distance education institutions should improve the quality of teaching in science and engineering education and find ways to provide high-quality experimental teaching practices. At the same time, they should scale back on instruction of literature, as well as education and law.

Keywords: distance education, face-to-face education, disciplines, return to education

Introduction

With the rise of massive open online courses (MOOCs), distance higher education has once again attracted attention. Distance education can offer learning on a large scale, worldwide. There are three ways for learners in China[1] to get junior college or undergraduate degrees: full time study in colleges and universities; adult schools; online education. According to the data of National Bureau of Statistics of China (2018), in 2018, the total number of Chinese undergraduate and junior college graduates is 11,659,684, of which the total number of undergraduate and junior college graduates through online education is 1,949,189. The number of online higher education graduates accounts for 16.72% of the total higher education graduates. A large proportion of adult education is also conducted through different forms of distance learning. Therefore, for China as a whole, the proportion of distance higher education graduates to all graduates is far more than 16.72%.

In spite of such a large scale, few empirical studies have analyzed the return to distance higher education. For example, Hoxby (2014) compared the return to distance education with that of face-to-face education. Castaño-Muñoz et al. (2016) claimed theirs was the first empirical analysis of the return to distance higher education compared with face-to-face higher education. In fact, earlier, some Chinese scholars had empirically compared the return to distance education with face-to-face education in a Chinese journal (Li, Li, & Zhang, 2015). Though there have been few empirical studies on the return to distance higher education, with the development of MOOCs, the field has attracted the attention of scholars from many countries. Even so, it seems there has been no empirical analysis comparing the return to distance higher education among different academic disciplines. This empirical study addressed this specific gap.

Since COVID-19, distance learning has been and will continue to be a popular learning method and channel. Distance higher education has been in greater demand. More and more learners want to know the benefits before they invest in distance higher education; this desire highlights the importance of the return to distance higher education among different disciplines. This paper used data collected from a large-scale survey in China to empirically analyze the return to distance higher education in different disciplines and make a comparative analysis with traditional face-to-face education to provide more empirical evidence in the field. This not only filled an academic gap, but also provided references and suggestions for distance higher education institutions and learners who want to invest in distance education.

Literature Review

Return to Education Among Different Disciplines

Since the emergence of the theory of human capital in the last century, there have been empirical studies on returns to education (Heckman et al., 2006). In addition to analysis of returns to different levels of schooling, studies have often compared the difference of returns among different groups, such as national differences, regional differences, gender differences, differences in public or private sector, and differences in various periods (Carnoy, 1995; Johnes et al., 2017; Psacharopoulos & Patrinos, 2004).

Many scholars have also paid attention to differences in academic majors and disciplines in terms of educational returns in face-to-face education. As early as the 1970s, Koch (1972) measured the private internal rates of return for various undergraduate majors from 1968 to 1969 in the US. Koch found that

several majors had the highest returns, such as mathematics (9.9%), economics (9.7%), and accounting (8.7%). In the last century, many studies empirically analyzed differences in the income or starting salaries in different disciplines and found that the salaries of students in engineering and economics disciplines were higher than in other disciplines (Altonji, 1993; Angle & Wissmann, 1981; Rumberger, 1984; Rumberger & Thomas, 1993). But Bottomley and Dunworth (1974) found that because of the higher costs for science and technology disciplines, the individual returns to science and technology were lower than returns to social science.

In this new century, numerous empirical studies have continued to analyze the disciplinary differences of educational returns and learner's income (Saha & Sensarma, 2011; Salas-Velasco, 2006; Thomas, 2000; Yang et al., 2011). Bell (2010) found that graduate students who majored in science, technology, engineering, and mathematics earned more than those who did not. Webber (2014) found that the average income of those majoring in engineering, computer science, and economics ranked higher than other students' income. Similarly, Abel and Deitz (2014) analyzed the return to different majors of American undergraduate education and found that the returns to engineering education were the highest (21%), followed by math, computer science, and health (18% for each), and followed by business (17%). Lemieux (2014) also pointed out that returns to engineering, health, and business were higher than those of other disciplines. Saha and Sensarma (2011) analyzed the returns to education for male students in India and found that engineering and management disciplines had the highest returns at the undergraduate level.

Some empirical findings have differed. McRae (2019) found that business majors had the highest expected return, while the return to engineering majors was the lowest. Wu and Tang (2020) found that business, science, and engineering had the lowest educational returns, while humanities and social sciences had higher returns. Mertens and Röbken (2013) found that the returns to science and business disciplines were higher, while the returns to engineering were negative at the master level. Mertens and Röbken also analyzed the disciplinary differences of return to doctoral education and found that doctorates in economics and law had the highest returns (13.76%), followed by 9.4% for social science, and 7.0% for engineering. It appears that disciplines and majors with the highest educational returns produce different results at various education levels.

There has also been some analyzing return in relation to gender differences in different disciplines. Glocker and Storck (2014) measured, by gender, the returns to different disciplines in three types of higher education institutions in Germany. They found that for male students in the universities of applied science, the returns to enterprise engineering, business, and chemical engineering were the highest, while for female students, the returns to computer science, and business were the highest. They also found that for male students in university, the returns to medicine, business, computer science, and enterprise engineering were the highest, while for female university students, the returns to medicine, dentistry, and business were the highest. For male students in vocational education, the returns to accounting, financial insurance, and computer science were the highest, while for female students, English, financial insurance, and marketing had the highest returns to education.

According to the existing studies, the returns to different disciplines have varied among different countries and time periods, and were also affected by gender, types of higher education institutions, and educational level. What kind of pattern is apparent in the disciplinary difference in the return to distance education?

Return to Distance Education

In the literature, compared with studies on the return to face-to-face education, the studies on the return to distance education were limited. Woodley and Simpson (2001) investigated students in UK open universities and found that although they were adult learners, these students could still obtain a considerable return to part-time study. Carnoy et al. (2012) explored the return to distance higher education in an open university in Spain. They found that the two-year second-cycle degree distance education program brought positive returns for learners while the three-year first-cycle degree did not bring learners the corresponding returns. Castaño-Muñoz et al. (2016) continued their analysis in this Spanish open university and came to the conclusion that distance education would improve learners' income. Furthermore, those who entered university at a younger age and with no income before enrolling would get higher returns. Li, Li, and Zhang G (2015) also found that distance learners had considerable returns, which were even greater for female and rural learners. Li (2018) found that in China, with the expansion of face-to-face and distance higher education, the returns to both distance higher education and face-to-face higher education were in decline, and the returns to distance higher education were lower than those to face-to-face higher education. Even so, distance higher education could still bring considerable returns to learners, though not all empirical studies supported the notion that distance education could bring positive returns. For instance, Hulten (2018) found that learners' costs for distance higher education outweighed the returns because the benefits of distance education were low.

There are few empirical studies on the return to distance education and even fewer empirical studies comparing the return to distance education in different majors or disciplines. Carnoy et al. (2012) found that in Spain, the distance learners who studied enterprise management, marketing and IT engineering had higher income, with females earning more than males.

Literature Review in Summary

Although there have been many studies of disciplinary differences in the returns to face-to-face education, and there have been few studies of the returns to distance education, and no empirical studies of disciplinary differences in the returns to distance education. Therefore, this study explored the returns to education among different disciplines and compared them in the context of face-to-face as well as distance higher education. This study used large-scale and representative survey data of adults to empirically analyze the effect of disciplinary differences on the returns to distance education in China's labor market, and so has addressed the paucity of empirical studies on returns to distance education.

Research Design and Data

Theoretical Framework

According to human capital theory, individual income is positive related to human capital accumulated by education (Gillies, 2017). If with the same educational level, the same amount of human capital should be accumulated, then individual income should not differ significantly between a distance and a face-to-face learner. However, from the perspective of screening theory, education is an ability signal for employers, whereby employers screen potential employees by education (Cooper & Davis, 2017).

Distance education in China results in a lower ability signal, which suggests a form of education with lower quality. According to screening theory, the return to face-to-face education should be higher than that of distance education. This study used these two competing theories to compare the differences of return to different disciplines of distance education as well as face-to-face education.

According to human capital theory (Becker, 1964), human capital includes special human capital and general human capital, with the former type described as irreplaceable and more professional. Each type differs for different disciplines, which affect the return to education among different disciplines. Therefore, the differences of return indicate the emphasis on type of human capital among different disciplines. In exploring the return among different disciplines, this study examined two key aspects, by comparing the return:

- between face-to-face and distance education within the same discipline, and
- among different disciplines under the same form of education.

Method

Since is often used to explore the returns to education (Li, 2018; Glocker & Storck, 2014; Mincer, 1974; Siphambe, 2000) this study used Mincerian earnings function to estimate the return to distance higher education. The standard Mincerian earnings function is:

$$LnY = a + b*S + c*EX + d*EX2 + \varepsilon \quad (1)$$

Y is individual income; LnY is the logarithm of individual income; S represents the education year; EX represents work experience; EX2 represents the square of work experience; ε is the residual item; a is an intercept; b, c, and d are all coefficients of variables; and b represents the increased rate of individual income to each marginal education year (i.e., Mincerian rate of return).

An important assumption is made in calculating the Mincerian returns to education, namely that education incurs opportunity cost only. However, for distance education, this assumption cannot stand. Many distance learners still hold down jobs when they study, so the opportunity cost for distance learners is low and coefficient b can no longer be the rates of return to distance education. However, b can reflect the return to distance education to some extent.

In addition, it should be noted that education is an endogenous variable. Academic discussion has long focused on the question of whether learners accumulate human capital through education and thus improve labor productivity (Schultz, 1961) and earn higher income, or if the individuals with better innate ability spontaneously choose to get a higher education level and thus get more income (Spence, 1973). This study did not explore the causal relationship between education and income, rather we simply used Mincerian earnings function to estimate the return to distance higher education in different disciplines, compared with face-to-face education. Nevertheless, it is also of great reference value to get the regression coefficient of distance education through Mincerian earnings function, which can then be compared with the relevant studies on face-to-face education (Psacharopoulos & Patrinos, 2004; Saha & Sensarma, 2011).

Data

This study used China Family Panel Studies (CFPS) data for empirical analysis. CFPS is a national large-scale household survey data with good national representativeness (ISSS, Peking University, 2013). We

used the adult data from CFPS 2010 which was a sample of 33,600 including information on education level, forms of education (i.e., distance vs. face-to-face), academic disciplines, and annual income.

To estimate the return to a certain education level by using Mincerian earnings function, the sub-sample of this education level and previous education level were put into the regression equation (Carnoy, 1995). To estimate the return to undergraduate education, the sub-samples of undergraduate and high school were put into the regression equation, and the coefficient of the years of education was then interpreted as the return to undergraduate education. Similarly, to estimate the return to junior college education, the sub-samples of junior college and high school were put into the regression equation. At present in China, only undergraduate and junior college students can obtain their degrees through distance education. Therefore, this study analyzed only the sub-samples of high school, junior college, and undergraduate. The total sample size was 6,821, of which 3,911 cases were individuals who were not working.

Of the 2,910 cases that remained, 56 cases lacked information on educational form and 199 lacked information on income. After these cases were deleted, 2,655 valid cases remained. These 2,655 cases became the total sample used in the analysis, including 1,275 cases of high school, 392 cases of distance junior college, 393 cases of face-to-face junior college, 326 cases of distance undergraduate, and 244 cases of face-to-face undergraduate.

This study analyzed the disciplinary differences of the return to distance higher education. After having observed the disciplinary distributions of distance higher education cases, the sample sizes of three academic disciplines were large enough to be analyzed separately, namely literature, economics, and management. Since the sample sizes of science, engineering, education, and law were relatively small, this study combined these four disciplines. Science and engineering were grouped together, and education and law were combined into a second category. In this way, the study analyzed the returns to these five different categories with 148 cases of literature, 245 cases of economics, 278 cases of management, 362 cases of science and engineering, and 222 cases of education and law.

Table 1 presents the simple descriptive statistics of the variables used in this study. It should be noted that CFPS 2010 did not include information on when individuals started working. There is no way to get accurate information on the working years for individuals in our sample. To address this, we subtracted a case's years of education from their age and then subtracted 6 ("age-years of education-6") to approximate number of working years (Romele, 2014).

Table 1

Descriptive Statistics for the Core Variables

Variable	Mean	Standard deviation
Logarithm of income	9.90	0.94
Years of education	13.78	1.75
Working years	12.26	6.99
Square of working years	199.23	185.15

Note. N = 2655.

The Results of Empirical Study

First, this study compared the differences in returns to distance and face-to-face education. Table 2 shows the regression results of the standard Mincerian earnings function for undergraduate and junior college. For both distance and face-to-face education, the coefficients of the years of education were significantly positive. This shows that whether through distance or face-to-face, higher education can bring significant returns to both junior college and undergraduates. The results may reflect the function of education as human capital (Gillies, 2017; Schultz, 1961; Wang & Sun, 2009) or as signal of ability (Cooper & Davis, 2017; Spence, 1973; Wang & Holton, 2005).

Table 2

Comparative Analysis of Return to Distance and Face-to-Face Education

Variable	Distance education		Face-to-face education	
	Junior college	Undergraduate	Junior college	Undergraduate
Years of education	0.12*** (0.02)	0.15*** (0.02)	0.16*** (0.02)	0.21*** (0.02)
Working years	0.11*** (0.01)	0.12*** (0.01)	0.14*** (0.01)	0.13*** (0.01)
Square of working years	-0.003*** (0.0004)	-0.004*** (0.0005)	-0.004*** (0.0005)	-0.004*** (0.0005)
Constant	7.44*** (0.22)	7.02*** (0.21)	6.88*** (0.26)	6.27*** (0.22)
Adj-R2	0.09	0.13	0.11	0.14
n	1635	1486	1638	1566

Note. The dependent variable is the logarithm of income; the value in brackets is the standard error.

*** $p < 0.01$.

From Table 2, we see that for the same educational form, the returns to undergraduate were higher than those to junior college; for the same education level, the returns to face-to-face education were higher than those to distance education. Further data analysis indicated the differences summarized in Table 2 to be statistically significant. The returns to undergraduate were higher than those to junior college, which is consistent with the existing empirical findings on the return to education in China (Chen et al., 2003; Ding et al., 2012). The returns to distance education were lower than those to face-to-face education, also consistent with the empirical studies on China's labor market (Li, L, & Zhang, 2015; Li, 2018). There are many explanations for why the returns to distance education are lower than those to face-to-face education, including the (a) lower signal value of distance education, (b) lower quality of distance education, and (c) lower opportunity cost of distance education (Castaño-Muñoz et al., 2016; Hoxby, 2014; Li, 2017; Stella & Gnanam, 2004).

However, this study did not focus on the reasons why the return to distance education was lower. Rather, we compared differences in the returns to distance higher education by academic discipline. Table 3

shows the regression results for the disciplines of literature, economics, and management by educational level and form (i.e., distance and face-to-face). Table 4 shows the regression results of science and engineering, as well as education and law, by educational level and form.

Table 3

Returns to Distance Education and Face-to-Face Education in Literature, Economics, and Management

Variable	Literature				Economics				Management			
	Distance		Face-to-face		Distance		Face-to-face		Distance		Face-to-face	
	Junior college	Undergrad	Junior college	Undergrad	Junior college	Undergrad	Junior college	Undergrad	Junior college	Undergrad	Junior college	Undergrad
Years of education	0.14**	0.14***	0.18***	0.15***	0.16**	0.16***	0.18***	0.27***	0.15***	0.21***	0.16***	0.18***
	(0.07)	(0.04)	(0.05)	(0.04)	(0.03)	(0.04)	(0.04)	(0.04)	(0.03)	(0.03)	(0.04)	(0.04)
Working years	0.12***	0.12***	0.12***	0.13***	0.12***	0.12***	0.12***	0.12***	0.12***	0.12***	0.13***	0.13***
	(0.02)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.02)	(0.01)	(0.01)	(0.01)	(0.01)
Square of working years	-0.004***	-0.004***	-0.004***	-0.004***	-0.004***	-0.004***	-0.004***	-0.004***	-0.004***	-0.004***	-0.004***	-0.004***
	(0.0005)	(0.0005)	(0.0005)	(0.0005)	(0.0005)	(0.0005)	(0.0005)	(0.0005)	(0.0005)	(0.0005)	(0.0005)	(0.0005)
Constant	7.16***	7.19***	6.69***	6.95***	6.88***	6.91***	6.69***	5.57***	7.08***	6.32***	6.92***	6.70***
	(0.83)	(0.43)	(0.68)	(0.45)	(0.41)	(0.48)	(0.46)	(0.47)	(0.38)	(0.41)	(0.49)	(0.48)
Adj-R2	0.07	0.08	0.07	0.07	0.08	0.07	0.08	0.09	0.08	0.09	0.07	0.08
n	1262	1285	1275	1288	1329	1278	1315	1281	1353	1290	1309	1280

Note. The dependent variable is the logarithm of income; the value in brackets is the standard error.

** $p < 0.05$. *** $p < 0.01$.

Table 4

Returns to Distance Education and Face-to-Face Education in Science and Engineering, and Education and Law

Variable	Science and engineering				Education and law			
	Distance		Face-to-face		Distance		Face-to-face	
	Junior college	Undergrad	Junior college	Undergrad	Junior college	Undergrad	Junior college	Undergrad
Years of education	0.12**	0.15***	0.19***	0.26***	0.05	0.14***	0.04	0.18***
	(0.04)	(0.04)	(0.03)	(0.02)	(0.04)	(0.03)	(0.05)	(0.04)
Working years	0.12***	0.12***	0.13***	0.13***	0.12***	0.12***	0.13***	0.12***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Square of working years	-0.004***	-0.004***	-0.004***	-0.004***	-0.004***	-0.004***	-0.004***	-0.004***
	(0.0005)	(0.0005)	(0.0005)	(0.0005)	(0.0005)	(0.0005)	(0.0005)	(0.0005)
Constant	7.38***	7.06***	6.52***	5.69***	8.19***	7.16***	8.34***	6.72***
	(0.47)	(0.51)	(0.38)	(0.29)	(0.48)	(0.35)	(0.61)	(0.45)
Adj-R2	0.07	0.07	0.08	0.14	0.07	0.08	0.07	0.07
n	1307	1274	1376	1367	1305	1309	1284	1286

Note. The dependent variable is the logarithm of income; the value in brackets is the standard error.

** $p < 0.05$. *** $p < 0.01$.

First, the returns to all disciplines in distance junior college were significant, except for the category of education and law. The coefficients were, listed in order: economics > management > literature> science and engineering > education and law, indicating that the returns of economics and management were higher than those to other disciplines for distance junior college students.

Second, the returns to all disciplines in distance undergraduate education were significantly positive, and the coefficients were, listed in order: management > economics> science and engineering > education and law = literature. For distance undergraduate students, the educational returns of management and economics were the highest. For management disciplines, the return to distance undergraduate was even higher than that to face-to-face undergraduate.

Third, the returns to all disciplines in face-to-face junior college education were significant, except for that of education and law. The coefficients were, listed in order: science and engineering > economics = literature > management > education and law.

Fourth, the returns to all disciplines in face-to-face undergraduate education were significantly positive. The coefficients were, listed in order: economics > science and engineering > management = education and law > literature.

Discussion

Our empirical results highlight several findings. First, economics, as well as science and engineering, had the highest returns to face-to-face education, in line with many existing studies (Abel & Deitz, 2014; Del Rossi & Hersch, 2008; Webber, 2014). This is probably due to the higher relative returns of those majors that focus on skills of quantitative analysis (Abel & Deitz, 2014).

Second, the returns to distance junior college education and distance undergraduate education in economics and management were the highest. Students who choose economics and management in distance education will see higher education returns. With the rapid development of China's economy and the great demand for these disciplines in the labor market, graduates from economics and management are very competitive in their search for employment. This result was also consistent with the empirical findings of face-to-face education—the disciplines and majors related to business and economics had higher returns (Altonji, 1993; Angle & Wissmann, 1981; Del Rossi & Hersch, 2008; Webber, 2014).

Third, whether face-to-face or distance education, the returns to literature, as well as education and law, were low. On the one hand, this indicated that at the junior college or undergraduate level, the degree of relationship between market-demand skills and the learned knowledge through literature, as well as education and law, was small. On the other hand, this may also be related to the rapid increase in the number of graduates in these disciplines. With the rapid development of China's economy and society, labor market demand for literature, as well as education and law, has risen to the level of professional master's degree (Huang et al., 2017; Ministry of Education of the People's Republic of China, 2012).

Fourth, the returns to science and engineering in face-to-face education were relatively high, but in distance education, the returns to science and engineering were relatively low, inconsistent with most existing studies in face-to-face education. Why were the returns to science and engineering in distance education lower? One reason for this disparity may be the lack of laboratory experience in distance education for science and engineering; the specific human capital of science and engineering is difficult to effectively accumulate at a distance.

The knowledge and skills learned in science and engineering are highly professional and classified as specific human capital (Becker, 1964). This kind of human capital, being valuable, scarce, irreplaceable, and non-imitative, can be used as the source of continuous competition for enterprises (Barney, 1991). Therefore, it is no wonder that in face-to-face education, compared with other disciplines such as management, literature, education, and law, the specific human capital of science and engineering is high and the returns to science and engineering very high as well. However, the accumulation of specific human capital of science and engineering requires the support of laboratories and experimental equipment. Laboratory work is central to science and engineering education (Feisel & Rosa, 2005) and laboratory practice is very important for science and engineering students to improve their skills in the labor market (Striegel, 2001).

However, compared with face-to-face education, distance education is weaker at offering opportunities to learn through conducting experiments because of the separation of teachers and students, as well as the lack of classrooms, laboratories, equipment, and so on. For example, Soysal (2000) pointed out that an obvious disadvantage of distance education is the lack of equipment for doing experiments. Feisel and Rosa (2005) pointed out that it is difficult to provide laboratory experience in the distance education. Therefore, it may be difficult for the distance education of science and engineering to effectively accumulate specific human capital in the absence of teaching and learning via experiments. As a result, the returns to science and engineering in distance education were not only lower than face-to-face education in the same discipline, but also lower than economics and management in distance education.

Correspondingly, the study of economics and management must be closely linked with the labor market (Li, 2017). Most distance learners study part-time. They already have some work experience and continue to accumulate experience in the labor market as they study. Therefore, of all disciplines, distance learners in management and economics can gain the highest returns. Especially in management, the return to distance education was even higher than that to face-to-face education at undergraduate level.

Conclusions

With the development of MOOCs and the spread of the COVID-19 epidemic, the returns to distance higher education have gradually attracted the attention of scholars worldwide. In the future, distance education is likely to become a hot topic in higher education, economics of education, and other related fields. However, to date, studies have rarely involved comparative analysis of the return to distance education in different disciplines. This study analyzed the differences of returns to different forms (i.e., face-to-face and distance education), different levels (i.e., junior college and undergraduate education), and different disciplines, namely literature, economics, management, science and engineering, as well as education and law, using data with a good national representativeness. The study produced four important empirical findings.

First, the returns to face-to-face education were higher than that of distance education for most disciplines. We used screening theory to explain this finding—the reputation of distance education in China is relatively low, resulting in less than positive signals to the labor market. Despite this, the returns to distance higher education were still considerable for most disciplines. Therefore, as a whole, it is still a good choice to invest in distance education.

Second, the returns to science and engineering education were higher in face-to-face education but lower in distance education. The study argues that the lack of laboratories and experiments, as well as the separation of teachers and students in the distance education, hinders the accumulation of specific human capital for science and engineering students.

Third, the returns to management and economics in distance education were the highest in all disciplines, and at the undergraduate level, the returns to distance management education were higher than those to face-to-face management education. These disciplines are closely related to the labor market. For distance education, most learners already have work experience and can accumulate the knowledge and skills related to economics and management through part-time study, thereby improving the return to distance education.

Fourth, no matter whether distance education or face-to-face education, the returns to literature, as well as education and law, were low. The study argues that due to the expansion of higher education in China, the requirements for the talents in these disciplines have been raised to the professional master level in China's labor market.

Implications

First, the purpose of the study was to explore the disciplinary differences of the return to distance education and compare them with face-to-face education. The comparison provides empirical findings to enhance our understanding of return to distance higher education.

Second, this study applied human capital theory and screening theory in distance education. We found that with the same educational level, the returns to face-to-face education were higher than to distance education. The reason may be that distance education produces a negative signal in the labor market because of its lower social reputation. This supports the notion that education plays a screening function and affects the return.

Third, the empirical results provide references for distance education learners and distance education institutions. For adult learners who hope to invest in distance higher education, they can consider the disciplines related to management and economics to bring higher returns. Distance education institutions should improve the teaching quality of science and engineering. In particular, China's distance education institutions can learn from the experience of international institutions to find high-quality solutions suitable for teaching via laboratory experiments (Lemckert & Florance, 2002; Pullen, 2001; Rudas & Horváth, 2004; Soysal, 2000; Striegel, 2001). Furthermore, taking into account market demand, distance education institutions should appropriately reduce the scale of literature, education, and law so as to match market demand.

Finally, this paper hopes that more scholars will carry out research on the return to distance higher education, which has already become an important part of higher education system in many countries.

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References

Abel, J. R., & Deitz, R. (2014). Do the benefits of college still outweigh the costs? *Current Issues in Economics and Finance*, *20*(3), 1–11. https://www.newyorkfed.org/medialibrary/media/research/current_issues/ci20-3.pdf

Altonji, J. G. (1993). The demand for and return to education when education outcomes are uncertain. *Journal of Labor Economics*, *11*(1), 48–83. https://doi.org/10.1086/298317

Angle, J., & Wissmann, D. A. (1981). Gender, college major, and earnings. *Sociology of Education*, *54*(1), 25–33. https://doi.org/10.2307/2112510

Barney, J. B. (1991). Firm resource and sustained competitive advantage. *Journal of Management*, *17*(1), 99–120. https://doi.org/10.1177/014920639101700108

Becker, G. S. (1964). *Human capital: A theoretical and empirical analysis, with special reference to education*. Columbia University Press.

Bell, C. M. (2010). *Graduate education attainment and salary: An examination of institutional type, major choice, gender, race/ethnicity, parental education and work experience differences* (Publication No. ED519348) [Doctoral dissertation, Ohio University]. https://etd.ohiolink.edu/!etd.send_file?accession=ohiou1273520207&disposition=inline

Bottomley, A., & Dunworth, J. (1974). Rate of return analysis and economies of scale in higher education. *Socio-Economic Planning Sciences, 8*(5), 273–280. https://doi.org/10.1016/0038-0121(74)90012-3

Carnoy, M. (1995). Rates of return to education. In M. Carnoy (Ed.), *International Encyclopedia of the Economics of Education* (pp. 364–369). Elsevier Science Ltd.

Carnoy, M., Rabling, B. J., Castaño-Muñoz, J., Montoliu, J. M. D., & Sancho-Vinuesa, T. (2012). Does on-line distance higher education pay off for adult learners? The case of the Open University of Catalonia. *Higher Education Quarterly, 66*(3), 248–271. https://doi.org/10.1111/j.1468-2273.2012.00520.x

Castaño-Muñoz, J., Carnoy, M., & Duart, J. M. (2016). Estimating the economic payoff to virtual university education: A case study of the Open University of Catalonia. *Higher Education*, *72*(1), 1–24. https://doi.org/10.1007/s10734-015-9935-1

Chen, X., Chen, L., & Xia, C. (2003). Rates of return to schooling in urban China: Changes in the 1990s. *Peking University Education Review, 2*, 65–72. https://www.cnki.net/kcms/doi/10.19355/j.cnki.1671-9468.2003.02.011.html

Cooper, J., & Davis, L. (2017). Exploring comparative economic theories: Human capital formation theory vs. screening theory. *Journal of Applied Business and Economics, 19*(6). https://articlegateway.com/index.php/JABE/article/view/732

Del Rossi, A. F., & Hersch, J. (2008). Double your major, double your return? *Economics of Education Review*, *27*(4), 375–386. https://doi.org/10.1016/j.econedurev.2007.03.001

Ding, X., Yu, H., & Yu, Q. (2012). Private returns to different education levels in urban China: 2002–2009. *Peking University Education Review*, *3*, 73–84. https://www.cnki.net/kcms/doi/10.19355/j.cnki.1671-9468.2012.03.008.html

Feisel, L. D., & Rosa, A. J. (2005). The role of the laboratory in undergraduate engineering education. *Journal of Engineering Education*, *94*(1), 121–130. https://doi.org/10.1002/j.2168-9830.2005.tb00833.x

Gillies, D. (2017). Human capital theory in education. *Encyclopedia of educational philosophy and theory* (pp. 1–5). Springer. https://doi.org/10.1007/978-981-287-532-7_254-1

Glocker, D., & Storck, J. (2014). Risks and returns to educational fields–A financial asset approach to vocational and academic education. *Economics of Education Review*, *42*, 109–129. https://doi.org/10.1016/j.econedurev.2014.06.004

Heckman, J. J., Lochner, L. J., & Todd, P. E. (2006). Earnings functions, rates of return and treatment effects: The Mincer equation and beyond. In E. A. Hanushek, S. J. Machin, & L. Woessmann (Eds.), *Handbook of the economics of education* (pp. 307–458). Elsevier. https://doi.org/10.1016/S1574-0692(06)01007-5

Hoxby, C. M. (2014). The economics of online postsecondary education: MOOCs, nonselective education, and highly selective education. *American Economic Review*, *104*(5), 528–533. http://dx.doi.org/10.1257/aer.104.5.528

Huang, B., Tang, J., & Hao, T. (2017). The development of professional degree postgraduate education in China. *China Higher Education, 2*, 18–24.

Hulten, C. R. (2018). The Importance of Education and Skill Development for Economic Growth in the Information Era. In: Hulten C. R., & Ramey, V. A. (Eds.), *Education, skills, and technical change: Implications for future US GDP growth* (pp.115-146). Chicago, USA: University of Chicago Press.

Johnes, G., Johnes, J., & López-Torres, L. (2017). Human capital and returns to education. In G. Johnes, J. Johnes, T. Agasisti, & L. López-Torres (Eds.), *Handbook of contemporary education economics* (pp. 1–20). Edward Elgar Publishing. https://www.elgaronline.com/view/edcoll/9781785369063/9781785369063.xml

Koch, J. V. (1972). Student choice of undergraduate major field of study and private internal rates of return. *Industrial and Labor Relations Review*, *26*(1), 680–685. http://dx.doi.org/10.1177/001979397202600106

ISSS, Peking University. (2013). Introduction of CFPS. http://www.isss.pku.edu.cn/cfps/en/index.htm?CSRFT=9OAW-DUVP-I5WW-JFGK-XEZH-JRL2-S420-1OLY

Lemckert, C., & Florance, J. (2002). Real-Time Internet mediated laboratory experiments for distance education students. *British Journal of Educational Technology*, *33*(1), 99–102. https://doi.org/10.1111/1467-8535.00243

Lemieux, T. (2014). Occupations, fields of study and returns to education. *Canadian Journal of Economics/Revue canadienne d'économique*, *47*(4), 1047–1077. https://doi.org/10.1111/caje.12116

Li, D. (2017). *The comparison of regional disparity of returns to education in China-An empirical study based on CHIP data* [Unpublished master's thesis]. Dongbei University of Finance Economics.

Li, F. L. (2017). The economics of distance education. In G. Johnes, J. Johnes T. Agasisti, & J. López-Torres (Eds.), *Handbook of contemporary education economics* (pp. 381–397). Edward Elgar Publishing.

Li, F. L. (2018). The expansion of higher education and the returns to distance education in china. *International Review of Research in Open and Distributed Learning*, *19*(4), 242–256.

Li, F. L., Li, Y. Y., & Zhang, S. G. (2015). The effect of distance higher education on the individual income: from the perspective of rural-urban difference and gender difference. *e-Education Research, 2015*(7), 49–54.

McRae, J. A. (2019). Estimating the financial return to education between fields of study. *SURG Journal*, *11*. https://doi.org/10.21083/surg.v11i0.5354

Mertens, A., & Röbken, H. (2013). Does a doctoral degree pay off? An empirical analysis of rates of return of German doctorate holders. *Higher Education*, *66*(2), 217–231. https://doi.org/10.1007/s10734-012-9600-x

Mincer, J. (1974). *Schooling, experience and earnings*. Columbia University Press.

Ministry of Education of the People's Republic of China. (2012). *Some opinions of the Ministry of Education on how to comprehensively improve the quality of higher education*. http://www.moe.gov.cn/srcsite/A08/s7056/201203/t20120316_146673.html

National Bureau of Statistics of China. (2018). Annual data (2018). https://data.stats.gov.cn/english/easyquery.htm?cn=C01.

Psacharopoulos, G., & Patrinos, H. A. (2004). Returns to investment in education: A further update. *Education Economics*, *12*(2), 111–134. https://doi.org/10.1080/0964529042000239140

Pullen, J. M. (2001, February). *Applicability of Internet video in distance education for engineering* [Paper presentation]. Frontiers in Education Conference, Reno, USA. https://doi.org/10.1109/FIE.2001.963893

Rudas, J., & Horváth, L. (2004). Course model based distance higher education of engineering modeling. *WSEAS Transactions on Advances in Engineering Education*, *1*(1), 67–72.

Romele, L. (2014). Estimation of rates of return to investments in education in Latvia. *Regional Formation and Development Studies*, *11*(3), 146–151. https://doi.org/10.15181/rfds.v11i3.623

Rumberger, R. (1984). The changing economic benefits of college graduates. *Economics of Education Review, 3*(1), 3–11. https://doi.org/10.1016/0272-7757(84)90003-7

Rumberger, R., & Thomas, S. (1993). The economic returns to college quality, major, and performance: A multilevel analysis of recent graduates. *Economics of Education Review, 12*(1), 1–19. https://doi.org/10.1016/0272-7757(93)90040-N

Saha, B., & Sensarma, R. (2011). Academic specialisation and returns to education: Evidence from India. *Journal of Education and Work*, *24*(5), 501–520. https://dx.doi.org/10.1080/13639080.2011.573775

Salas-Velasco, M. (2006). Private returns to a university education: An instrumental variables approach. *Higher Education*, *51*(3), 411–438. https://doi.org/10.1007/s10734-004-6413-6

Schultz, T. W. (1961). Investment in human capital. *American Economic Review*, *51*(1), 1–17.

Siphambe, H. K. (2000). Rates of return to education in Botswana. *Economics of Education Review, 19*(3), 291–300. https://doi.org/10.1016/S0272-7757(99)00042-4

Soysal, O. A. (2000). *Computer integrated experimentation in electrical engineering education over distance*. https://peer.asee.org/computer-integrated-experimentation-in-electrical-engineering-education-over-distance.pdf

Spence, M. (1973). Job market signaling. *The Quarterly Journal of Economics*, *87*(3), 355–374. https://doi.org/10.2307/1882010

Stella, A., & Gnanam, A. (2004). Quality assurance in distance education: The challenges to be addressed. *Higher Education*, *47*(2), 143–160. https://doi.org/10.1023/B:HIGH.0000016420.17251.5c

Striegel, A. (2001). *Distance education and its impact on computer engineering laboratories. https://www.researchgate.net/publication/2493514.* http://doi.ieeecomputersociety.org/10.1109/FIE.2001.963707

Thomas, S. L. (2000). Deferred costs and economic returns to college major, quality, and performance. *Research in Higher Education, 41*(3), 281–313. https://doi.org/10.1023/A:1007003510102

Wang, G. G., & Holton, E. F., III. (2005). Neoclassical and institutional economics as foundations for human resource development theory. *Human Resource Development Review, 4*(1), 86–108. https://doi.org/10.1177/1534484304273733

Wang, G. G., & Sun, J. Y. (2009). Clarifying the boundaries of human resource development. *Human Resource Development International, 12*(1), 93–103. https://doi.org/10.1080/13678860802638875

Webber, D. (2014, October). Is the return to education the same for everybody? *IZA World of Labor*. https://wol.iza.org/uploads/articles/92/pdfs/is-the-return-to-education-the-same-for-everybody.pdf

Woodley, A., & Simpson, C. (2001). Learning and earning: Measuring 'rates of return' among mature graduates from part-time distance courses. *Higher Education Quarterly*, *55*(1), 28–41. https://doi.org/10.1111/1468-2273.00172

Wu, C. T., & Tang, C. W. (2020). The impact of the expansion of higher education on the rate of return to higher education in Taiwan. In G. Fan & T. S. Popkewitz (Eds.), *Handbook of education policy studies* (pp. 137–147). Springer. https://doi.org/10.1007/978-981-13-8343-4_7

Yang, C. H., Lin, C. H. A., & Lin, C. R. (2011). Dynamics of rate of returns for postgraduate education in Taiwan: The impact of higher education expansion. *Asia Pacific Education Review*, *12*(3), 359–371. https://doi.org/10.1007/s12564-010-9132-y

[1] Unless otherwise specified, China in the paper refers in particular to the mainland of China, not including Hong Kong, Macao and Taiwan.

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The Relationship Between Learning Mode and Student Performance in an Undergraduate Elementary Statistics Course in the United States

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Abstract

Faculty have conducted many studies on the relationship between learning mode and student performance but few researchers have evaluated final grades, grade distribution, and pass rates in a sophomore introductory statistics course with a non-traditional student population who self-selected the learning mode from among different course sections. Accordingly, we examined 307 end-of-course grades from four different modes of instruction: (a) online, (b) videosynchronous learning classroom, (c) videosynchronous learning home, and (d) traditional classroom in an introductory statistics course. All data on grades, which included pass rate and grade distribution, were collected from the nine-week January 2019 term. All learning modes used the same text, syllabus, assignments, quizzes, and tests. In this study, learning mode was not significantly related to end-of-course score, final grade distribution, or pass rate. Future researchers should explore the impacts of gender, instructor quality, different term lengths, and the standardized use of textbooks and syllabi on student performance when exploring the impact of learning mode on grades, grade distribution, and pass rates.

Keywords: distance learning, online education, quality in higher education, student performance, grade distribution

Introduction

For several years, the option to complete undergraduate coursework and degree programs online has been increasing in U.S. institutions (Online Learning Consortium, 2016). Educators and administrators who wished to meet the needs of current and future students were the audience for studies evaluating the impact of delivery mode on student performance. However, since the coronavirus pandemic emerged in 2020, the number of academic courses offered online has accelerated, and there are even more administrators and educators grappling with the effective use of distance learning tools. There are several modalities within the realm of online education, including asynchronous and synchronous options. Because the literature has shown mixed results regarding equivalence in student outcomes based on modality (Jahng et al., 2007; Nguyen, 2015; Xu & Jaggars, 2013), it is vital to continue to study the influence of learning mode on student performance. Comparisons between synchronous and asynchronous learning modes can be difficult due to possible confounding variables such as learning management systems, texts, syllabi, and other delivery variables. We believe the mixed findings of studies comparing synchronous and asynchronous learning are possibly due to the settings from which the data were drawn. In other words, it is important to ensure that synchronous and asynchronous courses used for comparison share similar structures such as learning management systems, textbooks, syllabi, grade weightings for assignments, tests, quizzes, homework, and other assignments. Controlling for these variables is done through standardized course delivery so that data generated does not reflect the impact of different course delivery aspects.

Literature Review

The modality (delivery media) of a course does not consistently influence student outcomes. Some meta-analyses have supported no significant difference between student outcomes in online and traditional courses (Jahng et al., 2007; Lundberg et al., 2008), while others have reported significant differences (Means et al., 2009; Sitzmann et al., 2006; Williams, 2006). The outcomes investigated in these studies vary, including short term metrics such as grade distribution, pass rate, and withdrawal, and long-term metrics such as degree completion. For example, a study of community college students reported decreased student outcomes in online courses versus traditional courses; but it also reported that students who had completed some courses online were more likely to complete an associate's degree or transfer to an institution granting 4-year degrees (Johnson & Mejia, 2014). Shea and Bidjerano (2019) found similar results in large scale studies examining data on over 40,000 students from 2013 to 2017, concluding that 40% online to 60% classroom ratio as the best mix to earn an associate's degree.

Some researchers have reported that persistence in online courses has been problematic (Atchley et al., 2013; Jaggars et al., 2013; Murphy & Stewart, 2017). One possible reason is that students report lower instructor presence in online courses (Jaggars, 2014). However, Shea and Bidjerano (2016) conducted an investigation of national (rather than state) trends using data from the 2003-2004 academic year and found that online students had higher rates of associate degree attainment or transfer and lower dropout rates than their classroom-only student counterparts. This trend held true at the 6-year point of a student's academic career as well (Shea & Bidjerano, 2016).

While meta-analyses are imperative for analyzing trends by modality in undergraduate education, it is possible that significant differences may be seen within individual disciplines. There is limited literature exploring modality differences within, for example, undergraduate statistics, with much of the work being somewhat dated. Some studies reported that modality had no significant effect regarding the final course grade (McLaren, 2004; Summers et al., 2005) and successful completion (Dotterweich & Rochelle, 2012; Rochelle & Dotterweich, 2007). Other studies reported significant differences by modality, including higher grades for students completing the course in the traditional modality as compared to online and/or hybrid options (Lawrence & Singhania, 2004; Scherrer, 2011).

Interestingly, only one study reported significant differences by modality based on gender, with female students performing worse online than in the traditional classroom and no significant differences reported for male students in either modality (Flanagan, 2012). Online statistics modality has demonstrated a higher withdrawal rate (McLaren, 2004; Zimmerman & Austin, 2018). Test anxiety can predict course completion for the online modality, while self-concept can predict course completion for the traditional modality (Zimmerman & Austin, 2018).

These studies did reveal potential moderating variables for student outcomes in various modalities. Lower student satisfaction was reported for the online modality, specifically regarding instructor's explanations, class discussions, quality of problems, and evaluation and grading, even when the instructor was consistent and discussions and problems used in the course were equivalent (Summers et al., 2005). This is contrasted with Scherrer (2011) who reported no differences in satisfaction by modality. Dotterweich and Rochelle (2007) identified grade point average as a predictor for success in undergraduate statistics, regardless of modality, and noted that students who had a history of course failure did better in the traditional modality. Modality has not been linked to self-concept and value of statistics education (Zimmerman & Austin, 2018).

Bourdeau et al. (2018) and Roberts et al. (2019) conducted studies in different disciplines of English and Research Methods respectively. Their argument was that comparisons on student performance factors of end of course grades, pass rates, and grade distribution were made possible due to the standardized method of course delivery, which included learning management system, texts, syllabi, tests, quizzes, homework, and other assignments.

Modes of Learning

In this study, student assignments were constant across all modes of learning controlling for another possible source of confounding variables. The university used four primary modes of learning: classroom, online, synchronous video home, and synchronous video classroom (Bourdeau et al., 2018; Roberts et al., 2019).

Traditional Classroom Instruction (In Person)

The traditional legacy teaching format, sometimes referred to as *on ground*, is any form of instructional interaction that occurs in person and in real time. Before the advent of audio, video, and Internet technologies that allowed people to interact from different locations and at different times, student-instructor interactions occurred in the same place and at the same time.

Online

Online learning is education that takes place over the Internet. Sometimes described as e-learning, online learning is just one type of distance learning. Distance learning has a long history, and there are several types currently available. For the purposes of this research, courses referred to as online learning were asynchronous.

Videosynchronous Home (Blended)

The term *blended learning* is generally applied to the practice of using both online and in-person learning experiences when teaching. In a blended learning course, students attend a class taught by a teacher in a traditional classroom setting, while also completing online components outside the classroom. In-class time is supplemented by online learning assignments, and students learn the same topics online as they do in class. Asynchronous learning describes instruction and learning that do not occur in the same place or at the same time. The term applies to various forms of digital and online learning in which students learn, on their own, at their home, with instruction that is delivered via the Internet (Adobe Connect) in real time. For the purposes of this research, blended learning included 3 hours and 20 minutes of synchronous sessions and 90 minutes of online activities each week of the 9-week term.

Videosynchronous Classroom (Blended)

Videosynchronous classroom combines the live, in person traditional experience with additional students located in a "remote" classroom environment. Similar to the Videosynchronous Home mode, blended learning included 3 hours and 20 minutes of synchronous sessions and 90 minutes of online activities each week of the 9-week term.

All four modes of learning used the same textbook, discussion board prompts, homework, quizzes, and tests. A standardized syllabus was used for online (distance) and on ground (classroom) offerings of the course. Because of the uniformity by which the course was delivered, regardless of mode, the possible confounding variables of pedagogical method employed by the instructor were controlled (Bourdeau et al., 2018; Lou et al., 2006; Roberts et al., 2019).

There is a lack of consensus in the literature regarding the influence of modality on student outcomes in undergraduate statistics. This gap calls for studies examining universities that take a standardized approach to their courses, no matter what the delivery mode. Furthermore, online education is rapidly evolving, and a current perspective on this relationship is warranted.

Purpose

The purpose of this research was to explore student performance in multiple modes of instructional delivery. A medium-sized university offered the opportunity to minimize confounding factors by delivering an undergraduate statistics course in the following modes of instruction: online, videosynchronous learning classroom, videosynchronous learning home, and traditional classroom. The research question was: Is student performance in an undergraduate statistics course impacted by learning mode in any meaningful way? To evaluate the problem statement, the following hypotheses were proposed.

Hypotheses

The alternative hypotheses are:

Ha1. Student end-of-course scores are not all statistically equivalent among classroom, online, and videosynchronous modes of learning.

Ha2. There is a statistically significant relationship between grade distribution and learning mode.

Ha3. There is a statistically significant relationship between student pass rates and learning mode.

Method

We examined pass rates and grade distribution in an introductory statistics course that had four different modes of instruction: online, videosynchronous learning classroom, videosynchronous learning home, and traditional classroom. The university we studied offered five major terms a year. However, to reduce the probability of confounding variables (e.g., seasonal), only one term was studied.

Study Population Sampling

Data were taken from a mid-sized university that is rated as "more selective" (U.S. News and World Report, 2019). In 2019, approximately 90% of classes at this institution met in non-traditional modalities, including asynchronous online and video synchronous. Students enrolled in the studied sections were non-traditional students, with an average age of 34 years and 80% having a military affiliation (currently enlisted or veteran). Students -selected the delivery mode they would use to take the course.

Statistics Course Used in the Study

We examined end-of-course scores, grade distribution, and pass rates in an introductory statistics course. The course covered basic descriptive and inferential statistics using discussion boards and real-world assignments—practical exercises that had been successful in different teaching and learning platforms. Topics included types of data, sampling techniques, measures of central tendency and dispersion, elementary probability, discrete and continuous probability distributions, sampling distributions, hypothesis testing, confidence intervals, and simple linear regression.

The course was augmented by Pearson's MyLabStat, providing homework, quizzes, and tests. Canvas was the learning management system used in all modes of instruction (Instructure, 2020; Pearson, 2020).

Discussion Boards

Student assignments included participation in eight discussion boards which accounted for a total of 15% of the final grade. Discussions were used to reinforce concepts taught in corresponding modules. Students were required to make one initial post to a discussion prompt, and then to make two additional postings to initial posts made by classmates.

Written Assignments

Two discussion assignments requiring the use of spreadsheets to solve practical problems were precursors to written assignments which accounted for 15% of the overall grade. The first assignment required students to calculate means and standard deviations of airshow scores for eight different types of aircraft. Students then had to write a one-page letter announcing the winner of the air show. The second assignment, involving the effective use of spreadsheets, focused on mean, standard deviation, *z* scores, and probability when comparing flying squadron costs involving several aircraft and bases. The follow-up assignment was for students to write a one-page letter indicating which bases were the most and least cost-efficient.

Homework Assignments

Nine homework assignments were administered through Pearson's MyLabStat accounting for 10% of the total grade (Pearson, 2020). Homework assignments typically contained 20 to 30 questions and could be attempted up to three times by students to improve their grades. Homework assignment retakes used randomized problems meaning the students would not see the same homework questions twice. Homework assignments included a direct link to instructors where a student could ask a question about a particular problem. The instructor would receive a screenshot of the problem and could help the student by contacting the student to work through the problem or showing a step-by-step example of how to solve a similar problem. Students also had the option to view a step-by-step example of how to solve a particular problem through the MyLabStat software.

Quizzes and Exams

Eight module quizzes followed corresponding homework and were administered through Pearson's MyLabStat (2020). Quizzes were worth a total 20% of the overall grade. Quizzes were timed, with a 90-minute limit, and typically comprised of 10 questions. Students did not have the ability to ask for help during quizzes in order to accurately ascertain student retention.

The cumulative midterm examination, administered through MyLabStat, was worth 20% of the final grade. Students had one opportunity to take the midterm with a 120-minute time limit. Students did not have the option of seeing examples of particular problems or asking instructors for help. The midterm exam covered material from the first four modules of the course.

The final examination was also administered through MyLabStat and was worth 20% of the final grade. Students had a time limit of 120 minutes. Like the midterm examination, students did not have the option of seeing examples of how to solve problems, and they could not ask instructors for assistance during the final examination. The final examination all content in the course.

Data Collection

The January 2019 term was randomly selected to examine end-of-course grades. End-of-course scores were pulled in the aggregate (post hoc) from the learning management system after the term had ended. Students were not otherwise surveyed or contacted regarding the study. These scores provided the needed data to evaluate all three hypotheses. This term yielded 307 final grades from the four different learning modes (Gay et al., 2009; Gould & Ryan, 2012; Triola 2018). No student identification characteristics were included

the data set. The university institutional review board exempted this study from further formal institutional review.

Analysis

A total of 307 end-of-course grades were examined from the January 2019 term for the elementary university statistics course. The hypotheses were evaluated using a one-way analysis of variance (for end-of-course numerical scores) and chi-square tests for (letter) grade distribution and pass rates. The traditional alpha level of .05 was changed to a Bonferroni corrected alpha level of .017 because all three hypotheses were tested using the same data set. This conservative change was made to avoid falsely rejecting the null hypothesis (Gay et al., 2006; Gould & Ryan, 2013).

Results

The first hypothesis concerned student end-of-course scores in classroom, online, and videosynchronous learning (home and classroom) modes and suggested that scores in the four modes would not be statistically equivalent. Table 1 shows descriptive data broken out by learning mode.

Table 1

Means and Standard Deviations of End-of-Course Scores Based on Learning Mode

Learning mode	*N*	*M*	*SD*	Quartile 1	Quartile 3
Classroom	22	88.98	8.78	89.00	94.80
Videosynchronous classroom	12	88.21	8.87	82.75	94.65
Videosynchronous home	43	79.43	25.00	79.20	92.30
Online	230	84.17	19.76	82.50	94.70

Using an alpha level of .05, Levene's test for homogeneity of variance resulted in a high enough p value to conclude the variances between the learning modes were relatively similar meeting the condition required for the ANOVA test [$F(3, 303) = 2.32$, $p = .075$]. The ANOVA results were not impacted due to the differences in learning mode enrollment numbers. Differences in student performance ($n = 307$ final course grades) based on learning mode did not appear to be statistically significant ($\alpha = .017$) as shown in the ANOVA [$F(3, 303) = 1.41$, $p = .24$] conducted on end-of-course scores based on learning mode (Gay et al., 2006).

There was not enough evidence to support the alternate hypothesis that student end-of-course scores were not statistically equivalent between classroom, online, and videosynchronous learning (home and classroom) modes. As might be expected, pairwise post hoc tests are unnecessary due to the non-significant finding of the ANOVA test.

The second hypothesis attempted to determine if grade distribution and learning mode were related. The results of a chi-square test of independence ($\alpha=.017$) are presented in Table 2.

Table 2

Chi-Square Analysis on Association Between Grade Distribution and Learning Mode

Grade	Classroom	Videosynchronous classroom	Videosynchronous home	Online	Total
A	14	7	19	126	166
B	4	4	11	63	82
C	3	0	7	19	29
D	1	1	1	6	9
F	0	0	5	16	21
Total	22	12	43	230	307

Chi-square test:

Statistic	*df*	Value	*p*-value
Chi-square	12	11.37	.497

Note. *N*=307, (α=.017). The chi-square test reported a low cell-size warning. Data were collapsed into pass and fail categories in Table 3.

Test results indicated that learning mode and grade distribution were not related. Based on these results, there is no statistically discernable evidence to support the idea that student grades have a significantly different distribution based on type of course delivery.

The final hypothesis attempted to evaluate if there was a relationship between pass rate and learning mode. Data were evaluated using a chi-square test of independence (α=.017; Gay et al., 2006) and are presented in Table 3.

Table 3

Chi Square Analysis on Association Between Pass Rates and Learning Mode

	Classroom	Videosynchronous classroom	Videosynchronous home	Online
Pass	22	12	38	214
Fail	0	0	5	16
Total	22	12	43	230

Chi Square Test:

Statistic	DF	Value	P-value
Chi Square	3	4.05	.26

Note. n=307, (α=.017).

The chi-square test of independence results do not support the notion that pass rate and learning mode were related. Based on these results, we do not have discernable statistical evidence to support the research hypothesis that pass rates were significantly related to type of course delivery.

Discussion

This study contributes to the conflicting body of literature that seeks to determine the influence of course modality on student outcomes. In this study, there were no statistically significant findings regarding end of course grades, grade distribution or pass rates based on learning mode. In this case, "no significant difference" in the data results can be considered good news for researchers attempting to determine if students would be put at a disadvantage by using one learning mode instead of another. Regardless of learning mode, students in this study tended to do equally well. These results align with other studies that report no significant difference for short-term outcomes of final course grade in undergraduate statistics courses (McLaren, 2004; Summers et al., 2005) and successful completion (Dotterweich & Rochelle, 2012). It should be noted that possible confounding variables of the textbook, course design, types of assignments, and testing were controlled for by the use of truly standardized curricula across all four learning modes.

Limitations

Four limitations are identified in this study, all of which could be confounding or moderating variables on the results. Data are from a non-traditional student body whose average age is 34. Most students were working adults affiliated with the U.S. military. It cannot be assumed the same results would occur with a more traditional undergraduate student population (18-22 years old). Data were collected from the January 2019 term. Term length was 9 weeks. It cannot be assumed that similar results would occur in other terms or in more traditional 15-16-week terms without conducting a separate study. Students were not randomly assigned to each type of learning mode. Students enrolled in courses without interference or guidance from researchers. Results could be impacted due to the fact that students self-selected into one of the four different types of courses examined. No controls were built into this research to compensate for students' prior expertise with statistics.

Recommendations for Future Research

Future work should attempt to explore moderating variables. Only one study reports gender as a moderating variable; a future study that explores this could support or provide counterevidence to the conclusion that females are less successful in online statistics courses (Flanagan, 2012).

There are two conflicting studies regarding the influence of the instructor (e.g., explanations and grading) and course design (e.g., class discussions and quality of problems) (Scherrer, 2011; Summers et al., 2005). A future study could explore this variable through student perspectives. A measure of student perspectives could also investigate self-concept in order to explore the assertion by Zimmerman & Austin (2018) that self-concept does not influence course completion in traditional statistics but does play a role in online statistics.

Other variables worth exploring in future studies include the use of common syllabi and texts across learning platforms, faculty experience with course content and technology, and how students select learning modes when taking classes. The variables of timing (what term the course was taken in) and term length (traditional versus compressed term formats) should be included in future research to determine their possible impact on student performance.

Future studies should be designed to ascertain a better understanding of variables associated with why students select specific modes of learning. These variables could range from learning style to demographic and academic preparedness potential as measured through standardized tests. These variables could also be used to determine if groups under examination are different, which could impact analysis and results.

The methodology of this study could be replicated on both traditional (defined here as ages 18 to 22) and non-traditional student populations.

References

Atchley, T. W., Wingenbach, G., & Akers, C. (2013). Comparison of course completion and student performance through online and traditional courses. *The International Review of Research in Open and Distributed Learning, 14*(4). https://doi.org/10.19173/irrodl.v14i4.1461

Bourdeau, D., Griffith, K., Griffith, J. C., & Griffith J. R. (2018). An investigation of the relationship between grades and learning mode in an English composition course. *Journal of University Teaching and Learning Practice, 15*(2), 1-13. https://ro.uow.edu.au/cgi/viewcontent.cgi?article=1788&context=jutlp

Dotterweich, D. P., & Rochelle, C. F. (2012). Online, instructional television, and traditional delivery: Student characteristics and success factors in business statistics. *American Journal of Business Education, 5*(2), 129-138. https://doi.org/10.19030/ajbe.v5i2.6815

Flanagan, J. (2012). Online versus face-to-face instruction: Analysis of gender and course format in undergraduate business statistics courses. *Academy of Business Research, II*, 93-101. https://ssrn.com/abstract=2627101

Gay, L. R., Mills, G. E., & Airasian, P. W. (2009). *Educational research: Competencies for analysis and application* (9th ed.). Pearson.

Gould, R. N., & Ryan, C. N. (2012). *Introductory statistics* (1st ed.). Pearson.

Instructure. (2020). *Canvas learning management system* [Computer software]. Instructure. https://www.instructure.com/canvas/

Jaggars, S. S. (2014). Choosing between online and face-to-face courses: Community college student voices. *American Journal of Distance Education, 28*(1). http://dx.doi.org/10.1080/08923647.2014.867697

Jaggars, S. S., Edgecombe, N., & Stacey, G. W. (2013). *What we know about online course outcomes* (ED542143). ERIC. https://files.eric.ed.gov/fulltext/ED542143.pdf

Jahng, N., Krug, D., & Zhang, Z. (2007). Student achievement in online distance education compared to face-to-face education. *European Journal of Open, Distance, and E-Learning, 10*(1). https://core.ac.uk/download/pdf/24065525.pdf

Johnson, H. P., & Mejia, M. C. (2014, May). *Online learning and student outcomes in California's community colleges*. Public Policy Institute of California. http://www.ppic.org/content/pubs/report/R_514HJR.pdf

Lawrence, J. A., & Singhania, R. P. (2004). A study of teaching and testing strategies for a required statistics course for undergraduate business students. *Journal of Education for Business, 79*(6), 333-338. https://doi.org/10.3200/JOEB.79.6.333-338

Lou, Y., Bernard, R. M., & Abrami, P. C. (2006). Media and pedagogy in undergraduate distance education: A theory-based meta-analysis of empirical literature. *Educational Technology Research and Development, 54*(2), 141-176. https://doi.org/10.1007/s11423-006-8252-x

Lundberg, J., Castillo-Merino, D., & Dahmani, M. (2008). Do online students perform better than face-to-face students? Reflections and a short review of some empirical findings. *RUSE: Revista de Universidad y Sociedad del Conocimiento, 5*(1), 35-43. https://pdfs.semanticscholar.org/f929/9785feccbe1cb20758d56912cf18f00ce1d4.pdf?_ga=2.79216084.1973320332.1607120314-1946193882.1607120314

McLaren, C. H. (2004). A comparison of student persistence and performance in online and classroom business statistics experiences. *Decision Sciences Journal of Innovation, 2*(1), 1-10. https://doi.org/10.1111/j.0011-7315.2004.00015.x

Means, B., Toyama, Y., Murphy, R., Bakia, M., & Jones, K. (2009). *Evaluation of evidence-based practices in online learning: A meta-analysis and review of online learning studies*. U.S. Department of Education. https://www2.ed.gov/rschstat/eval/tech/evidence-based-practices/finalreport.pdf

Murphy, C. A., & Stewart, J. C. (2017). On-campus students taking online courses: Factors associated with unsuccessful course completion. *The Internet and Higher Education, 34*, 1-9. https://doi.org/10.1016/j.iheduc.2017.03.001

Nguyen, T. (2015). The effectiveness of online learning: Beyond no significant difference and future horizons. *Journal of Online Learning and Teaching, 11*(2), 309-319. http://jolt.merlot.org/Vol11no2/Nguyen_0615.pdf

Online Learning Consortium. (2016, February 9). *Babson study: Distance education enrollment growth continues*. Online Learning Consortium. https://onlinelearningconsortium.org/news_item/babson-study-distance-education-enrollment-growth-continues-2/

Pearson. (2020). *MyLabStat* [Computer software]. Pearson. https://www.pearsonmylabandmastering.com/northamerica/mystatlab/

Roberts, D., Griffith, J., Faulconer, E., Wood, B., & Acharyya, S. (2019). An investigation of the relationship between grades and learning modes in an introductory research methods course. *Online Journal of Distance Learning Administration*, *22*(1) 1-13. https://www.westga.edu/~distance/ojdla/spring221/roberts_griffith_faulconer_wood_acharyya221.html

Rochelle, C. F., & Dotterweich, D. (2007). Student success in business statistics. *Journal of Economics, 6*(1), 19-24. https://www.economics-finance.org/jefe/econ/Rochellepaper.pdf

Scherrer, C. R. (2011). Comparison of an introductory level undergraduate statistics course taught with traditional, hybrid, and online delivery methods. *INFORMS Transactions on Education, 11*(3), 106-110. https://doi.org/10.1287/ited.1110.0063

Shea, P., & Bidjerano, T. (2019). Effects of online course load on degree completion, transfer and dropout among community college students of the State University of New York. *Online Learning, 23*(4). https://doi.org/10.24059/olj.v23i4.1364

Shea, P., & Bidjerano, T. (2016). A national study of differences between distance and non-distance community college students in time to first associate degree attainment, transfer, and dropout. *Online Learning*, *20*(3), 14-15. http://dx.doi.org/10.24059/olj.v23i4.1364

Sitzmann, T., Kraiger, K., Steward, D., & Wisher, R. (2006). The comparative effectiveness of web-based and classroom instruction: A meta-analysis. *Personnel Psychology, 59*(3), 623-664. https://doi.org/10.1111/j.1744-6570.2006.00049.x

Summers, J. J., Waigandt, A., & Whittaker, T. A. (2005). A comparison of student achievement and satisfaction in an online versus traditional face-to-face statistics class. *Innovative Higher Education, 29*(3), 233-250. https://doi.org/10.1007/s10755-005-1938-x

Triola, M. F. (2018). *Elementary statistics: Using Excel* (6th ed.). Pearson.

U.S. News and World Report. (2019). Embry-Riddle Aeronautical University. *U.S. News and World Report: Best Colleges Rankings*. https://www.usnews.com/best-colleges/embryriddle-aeronautical-university-1479

Williams, S. L. (2006). The effectiveness of distance education in allied health science programs: A meta-analysis of outcomes. *American Journal of Distance Education, 20*(3), 127-141. https://doi.org/10.1207/s15389286ajde2003_2

Xu, D., & Jaggars, S. S. (2013). The impact of online learning on students' course outcomes: Evidence from a large community and technical college system. *Economics of Education Review, 37*, 46-57. https://doi.org/10.1016/j.econedurev.2013.08.001

Zimmerman, W. A., & Austin, S. R. (2018). Using attitudes and anxieties to predict end-of-course outcomes in online and face-to-face introductory statistics course. *Statistics Education Research Journal, 17*(2), 68-81. https://iase-web.org/documents/SERJ/SERJ17(2)_Zimmerman.pdf


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A System of Indicators for the Quality Assessment of Didactic Materials in Online Education

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Abstract

The quality of didactic materials is a source of concern for teachers, users, and educational institutions that offer online education. There is a lack of indicators to help assess the quality of three key types of didactic materials commonly used in online education: didactic units (i.e., materials that contain program contents), didactic guides (i.e., materials that provide information), and additional didactic materials (materials to deepen knowledge). The objective of this article is to present a system of indicators designed to assess the quality of these types of didactic materials and guide their creation process. The system was developed based on a critical analysis of existing models designed to assess the quality of digital didactic materials. The system was validated by 16 international experts in online education, and a trial application of the system assessed five didactic guides and didactic units used by online universities in three different countries. Results of the validation process were triangulated with relevant literature, allowing the authors to make decisions regarding changes to the system in terms of maintaining, reformulating, or removing indicators. The resulting system comprises 43 assessment indicators and serves as a guide for designers, teachers, and users in the creation and selection of didactic materials for use in online education and in the assessment of their quality.

Keywords: online education, didactic materials, quality, indicators, system, assessment

Introduction

There is no doubt that didactic materials are an essential factor in online education, where teachers cease to be the main transmitters of knowledge. In online education, didactic materials are the most important source of information, as Bautista Liébana et al. (2001) assert, "although all teaching uses them, online education in particular depends mainly on the materials to such a point that it cannot be understood without them" (p. 6). Didactic materials are the main instrument for the transmission of knowledge to students. These materials can also promote independent learning and influence the quality of the educational process. However, in order for didactic materials to fulfill these functions, they must be sufficient in quantity and quality.

In online education, there are a variety of didactic materials and different ways of classifying them (Shattuck, 2014). For example, Blanco Gil et al. (2010) classify didactic materials as conventional materials (e.g., textbooks, digital boards, and worksheets), audio-visual materials (e.g., slides, videos, and audio recordings), new technologies (e.g., videogames, presentations, interactive multimedia, Web pages, WebQuest, forums, and Wikis), materials used to present information (i.e., didactic units), materials to organize information (e.g., tutorials, guides, conceptual outlines, summaries, overviews, and flowcharts), and materials to develop skills (e.g., examples, analogies, questions, and exercises to apply content). In the development of the quality assessment system, we focused our attention on three types of didactic materials: didactic guides, didactic units, and additional didactic materials, as they are the most commonly used in online education (see García Aretio, 2014).

We define a didactic unit as a structured and organized material that contains all of the contents of a program (see García Martín et al., 2010). A didactic guide refers to all materials that provide information to familiarize students with the subject so that "they do not have to guess or look for clues" (Asinsten, 2011, p. 6), such as information about what they are going to study and for what purpose; how, when, with what, and with whom they will study; and how evaluation will be conducted. Additional didactic materials (also called complementary materials) constitute materials that allow students to deepen their knowledge, the reading of which is optional. According to Blanco Gil et al.'s (2010) classification, these materials may include conventional and audiovisual materials, new technologies, and materials to develop skills.

When these three types of didactic materials are of high quality, they contribute to improving students' learning processes, as Hyla (2016) points out, "the main factor that contributes to the learning process in online education is the quality of the didactic materials" (p. 152). According to the Spanish Association for Standardization and Certification (AENOR, 2017), a didactic material of high quality "is capable of satisfying the needs of its users. This means, when it comes to online education (i.e., digital environments), that it is effective from the didactic, technological, and accessibility points of view" (p. 45). In order for the didactic materials to be of high quality, the professionals involved in the creation process (e.g., designers, teachers) must consider their quality from the very beginning. However, practice shows that educators often lack knowledge, guidelines, and specialized literature on how to create or select high quality didactic materials and which indicators to use to evaluate them (AENOR, 2017; Hyla, 2016; Marciniak, 2017; Padrón et al., 2006; Rushby & Surry, 2016). This gap has not been addressed so far (or has only been partially addressed), as scholars such as Rodríguez Rodríguez and Martinez Bonafé (2016) note:

> A significant portion of recent research seems to highlight the lack of knowledge that currently exists when it comes to models and assessment guides for didactic materials, both in printed and digital formats, and their use in the educational context (p. 8).

A number of scholars and organizations have proposed different models to assess the quality of online education and the didactic materials used in this type of education (Marciniak, 2018; Vlachopoulos, 2016), such as Nielsen and Morkes (1998), Nesbit et al. (2002), Bravo Ramos (2005), Opdenacker et al. (2009), Marzal et al. (2008), Morales Morgado et al. (2010), Fernández-Pampillón Cesteros et al. (2012a), the National Distance Education University of Spain (UNED, n.d.), and AENOR (2017). These models focus on various contextual dimensions and include indicators that should be considered when designing or selecting didactic materials; however, the models combine a diversity of approaches and, at times, respond to contradictory and opposing paradigms. As a result, the proposed indicators refer to the quality of divergent didactic materials and, moreover, are assigned different meanings (Marciniak, 2016). In addition, the literature focuses on some aspects of online didactic materials (e.g., usability, visibility, flexibility, ease of use, and pedagogical and graphic design) but rarely highlights the need to assess the quality of the three types of didactic materials (i.e., didactic unit, didactic guide, and additional didactic materials). To address this gap, we conducted a study with the aim of designing a system of indicators applicable to the creation of quality online didactic materials, as well as their evaluation and improvement. As Fernández-Pampillón Cesteros et al. (2012b) propose,

> In order to definitively address and promote the development of high quality digital didactic materials, it is essential to have systems to evaluate and recognize the quality of the teacher's teaching production in addition to those already in place for scientific production. These systems must necessarily be based on quality assessment models and tools that are easy to use both by the teachers who create these materials and by the evaluators who are also usually teachers (p. 26).

Reference Models for Designing the System

Illum Hansen and Toke Gissel (2017) assert,

> When we talk about good didactic materials and the quality of didactic materials, this presupposes that there is a number of fairly stable factors that apply to those who will be using the didactic materials (students, teachers and educators), and the contexts in which they will be used (teaching and lesson situations). In other words, it is implicit that they have been judged on specific didactic functions and purposes in a particular context (p. 129).

To address these challenges, several scholars have developed models related to the quality assurance of didactic materials intended for online education. Most of the models approach the evaluation of these materials from different perspectives. Table 1 presents a comparative analysis of 10 of the models analyzed in the bibliographic research conducted for this study. The analysis is presented in chronological order.

Table 1

Comparative Analysis of 10 Models Developed to Assess the Quality of Didactic Materials

Author/Year	Model description	Assessment dimensions
Nielsen and Morkes (1998)	A collection of general rules for evaluating the usability of digital didactic materials.	• Visibility • Correspondence between the system and the real world • Possibility of material control by the user • Internal and external consistency with standards • Mistakes • Difficulty • Flexibility and efficiency • Design • Possibility of correcting errors • Helping users
Nesbit et al. (2002)	The learning object review instrument (LORI) model is a tool for evaluating and commenting on virtual teaching resources. The model aims to facilitate and support the evaluation of multimedia materials.	• Quality of content • Correspondence with learning objectives • Feedback and adaptability • Motivation • Design and presentation • Usability • Accessibility • Reusability • Compliance with standards
Bravo Ramos (2005)	A guide for evaluating materials with recommendations for their creation.	• Efficacy • Ease of use • Quality and quantity of links • Quality and quantity of multimedia elements • Quality of content • Navigability • Technology used • Visual attractiveness • Suitability to recipients
Espinoza and González (2006)	An evaluation tool that includes basic factors for consideration in the evaluation of printed didactic materials in a virtual context.	• Identification data • Book format • Graphic design • Content analysis
Opdenacker et al. (2009)	The quality assessment of digital educational material (QuADEM) model provides a comprehensive	• Educational objectives • Content • Style and language

	method for evaluating the quality of digital didactic materials used in blended learning.	• Usability • Learning style • Drafting style • Examples • Multimedia • Questionnaires
Marzal et al. (2008)	A model based on a cognitive perspective of information processing and expected student competencies.	• Recruitment • Loyalty • Literacy skills
Morales Morgado et al. (2010)	The reusable learning teaching objects assessment tool (HEODAR) was developed at the University of Salamanca for the comprehensive assessment of didactic materials.	• Psycho-pedagogical aspects • Didactic-curricular aspects • Technical aspects • Functional aspects
Fernández-Pampillón Cesteros et al. (2012a)	A model to assess the potential quality of a digital didactic material before its use by real users. The model comprises 10 criteria and includes an application guide. It can be applied in peer assessment, collaborative assessment, or self-assessment.	• Didactic documentation • Quality of content • Interactivity and adaptability • Motivation • Format and design • Usability • Accessibility • Reusability • Interoperability
National Distance Education University of Spain (UNED, n.d.)	A protocol for the evaluation of distance didactic materials addressed to UNED students to obtain their opinions on the quality of didactic materials used during a course.	• Introduction • Objectives • Learning guidelines • Aspects related to the presentation of the content of materials
Spanish Association for Standardization and Certification (AENOR, 2017)	The UNE 71362 Standard is a model to define and evaluate, quantitatively and qualitatively, the quality of digital didactic materials. It includes 15 criteria to measure the didactic effectiveness of materials, their technological effectiveness, and their accessibility.	• Didactic description: value and coherence • Quality of content • Capacity to generate learning processes • Adaptability • Interactivity • Motivation • Format and design • Reusability • Portability • Technical stability • Structure of learning scenario • Navigability • Operability • Accessibility of audiovisual content

Accessibility of textual content

The analysis presented in Table 1 shows that the 10 models focus on different aspects of the evaluation of online didactic materials, such as graphic and pedagogical design, suitability to recipients, content quality, learning activities, ease of use, visibility, accessibility, and flexibility. The authors of the analyzed models also propose evaluating other aspects that, in their opinion, define the quality of the materials to a greater or lesser degree. Yet, these models have certain disadvantages. One disadvantage is the lack of consensus among the models regarding the number of dimensions and indicators. Some models evaluate only four dimensions, while others propose up to 15. Furthermore, the models assign different meanings to the indicators used to assess these dimensions.

An in-depth study of the indicators proposed in these models revealed that their meanings differ depending on their author and the methodology used. While, for example, Nesbit et al. (2002) equate the "content quality" indicator with truthfulness, accuracy, a balanced presentation of ideas, and an adequate level of detail; Bravo Ramos (2005) regards content quality as both the scientific rigor of the expressive resources and techniques they use. According to Opdenacker et al. (2009), the authors of the QuADEM model, this indicator assesses the correspondence of a didactic material with the training objectives and the suitability of the material to its recipients.

It is important to note that none of the analyzed models proposes specific indicators to assess the quality of the three types of didactic materials commonly used in online education: didactic guides, didactic units, and additional materials. Although some of the proposed indicators can serve as a frame of reference to assess elements of these materials, they do not allow for a comprehensive evaluation of them. To address the disadvantages described above, it is necessary to develop a system of indicators to help those involved in online education (e.g., designers, teachers, or users) to create or select the three types of didactic materials and assess their quality.

Methodology

The design of our indicator system was based on bibliographic research of existing models and standards used to evaluate didactic materials intended for both traditional and online education. Based on the results of this analysis, we identified the indicators that should be considered when creating or evaluating the didactic units, didactic guides, and additional materials that online teachers use to enrich the teaching and learning process. The results of the bibliographic research also helped us build a system of 45 indicators to measure each of these types of materials.

As the system was the result of our elaboration on existing models, it was essential to validate it through a methodological procedure to determine its reliability in terms of the degree to which the proposed indicators evaluate what they were expected to evaluate. For this purpose, a panel of 16 experts from different countries (i.e., Chile, Italy, Mexico, Paraguay, Poland, Portugal, Spain, and the United States) were selected based on their experience in the field of online education didactic materials. The experts included researchers, online teachers and students, and members of the different accreditation agencies for the quality of online higher education. The experts were asked to determine the validity of each of the indicators of the proposed system based on an evaluative judgment of its univocity, relevance, and importance. The quantitative and qualitative validation of the model was conducted based on the results

of the expert panel. The qualitative validation was conducted based on a compilation of the experts' comments on the reasons for their validation and their suggestions to improve the system.

To augment the experts' qualitative validation, a trial application of the proposed system of indicators was conducted. The objective of the pilot was to delimit the reliability of the system, to determine the degree of internal consistency for each of the indicators and for the entire system. The trial application consisted of assessing five didactic guides and didactic units and a set of additional materials from five academic programs (i.e., fundamentals of administration, effective communication in health, quality systems, communication and financing management, and project management) offered by three online universities in different countries (i.e., Mexico, Poland, and Spain). Access to the virtual platforms of the participating universities was obtained, and the suitability of most of the system indicators was verified in the different contexts. Data was collected using assessment protocols for each material, which served as a guideline for observation and evaluation. By way of example, Table 2 shows a fragment of the protocol for the assessment of didactic unit.

Table 2

A Fragment of an Assessment Protocol

Indicator	Assessment		Comments
	Yes	No	
The didactic unit presents the objectives of the learning process to be achieved by its end.		X	The didactic unit does not present the educational objectives of the learning process.
The didactic unit contains a set of learning activities.	X		The didactic unit contains a wide range of learning activities, which include, among others: drafting of essays, drafting of comparative tables, case studies, and watching and commenting on videos.

Results of the trial application of the system were triangulated with the experts' validation and relevant literature, which allowed us to make decisions regarding each of the system indicators: whether they should be maintained, modified, or eliminated (see example in Table 3). This process resulted in a definitive system of 43 indicators for the assessment of the quality of didactic materials for online education.

Table 3

Triangulation of Results for Indicator 29: The Didactic Guide Includes the Thematic Contents of the Online Training Program

Quantitative validation	Qualitative validation	Relevant literature
Indicator with high levels of validity across quantitative indexes: average index = 0.80; average CVR index = 1; average Fleiss Kappa index = 0.83.	Universities: All of the universities used this indicator. Experts: Indicator with maximum validity in all criteria.	García Martín et al. (2010) affirm that didactic guides must provide information on the contents of the subject and its grouping into didactic units. According to National Agency for Quality Assessment and Accreditation (ANECA, 2019), teaching guides should contain a description of each subject (e.g., objectives, competencies, bibliography, and syllabus), training activities, and evaluation systems.

Note. Researchers' decision: The indicator is maintained.

Results

Proposed Indicators

The system includes a total of 43 assessment indicators. Table 4 presents the system structure, in terms of the distribution of indicators across the didactic material types.

Table 4

Distribution of Indicators to Assess the Quality of Didactic Materials for Online Education

Didactic material	Indicators (n)
Didactic unit	23
Didactic guide	11
Additional didactic materials	9
Total	43

The 23 indicators chosen to assess the quality of didactic units allow us to assess, among other factors, whether the title of the material is clear and whether the material includes an index and an introduction, presents the learning objectives, contains all content on the subject, is well structured and organized, and presents basic and additional bibliography and other supporting elements. The 11 indicators proposed to assess the quality of didactic guides allow us to determine whether the material provides students with information about what they are going to study, why, how, when, with whom; and how they can evaluate what they have learned. In addition, these indicators allow us to assess whether the didactic guide includes all of the information necessary to familiarize students with the elements of the program and whether these elements are organized in a manner that allows for meaningful learning experiences. The nine indicators chosen to assess the quality of additional didactic materials allow us to assess whether there are additional materials on the subject, of different types, that are suitable for online education; and whether they are sufficient in quantity and quality. Furthermore, these indicators

assess the technical aspects for all types of materials, such as ease of use, interactivity, navigability, interoperability, and accessibility. Table 5 presents the system of indicators chosen to assess the quality of the three types of didactic materials mentioned above.

Table 5

The System of Indicators for Quality Assessment of Didactic Materials in Online Education

No.	Indicator	Description
	Didactic unit	
	Title	
1	The title of the didactic unit refers to its most relevant content.	The title of the didactic unit must make reference to its most relevant aspects.
2	The title of the didactic unit is easy to understand.	The title of the didactic unit must be clear and easy to understand, use simple language, and clear and direct terms according to the audience and the subject terminology.
	Index	
3	The index of the didactic unit is comprehensive.	The index must indicate the exact location of each topic and subtopic of the unit for the student (i.e., it is comprehensive).
4	The index of the didactic unit indicates the page on which each subject is explained.	The index should indicate the pages of each topic to facilitate navigation by the student.
	Introduction	
5	The didactic unit contains an introduction.	The didactic unit must contain an introductory text that helps familiarize the student with the subject, lexicon, and other aspects of the content to be studied.
6	The didactic unit contains a summary of its content.	The introduction should briefly explain each part of the unit (i.e., its topics) and present the objectives; expected results of the learning process; or, at least, its purpose.
7	The didactic unit briefly explains each part of the unit.	The introduction must capture the student's attention from the start. It must invite the reader to continue reading.
	Learning objectives	
8	The didactic unit presents the objectives of the learning process to be achieved by its end.	The didactic unit must present the educational objectives, clearly describing what is to be achieved upon completion.

9	All the educational objectives of the didactic unit are appropriate to the student's graduation profile.	All objectives of the didactic unit must be appropriate to the student's graduation profile in terms of cognitive, procedural, and attitudinal competencies.
	Development of content	
10	A minimum of 25% of the presented information must have been generated in the past 5 years.	The contents of the didactic unit must be updated based on new advances in research, regulations, and current knowledge. A minimum of 25% of the references cited must have been published in the past 5 years.
11	The contents of the didactic unit match its learning objectives.	The contents of the didactic unit must be consistent with the learning objectives set therein.
12	The contents of the didactic unit are complete and guarantee the achievement of the learning objectives of the online program.	All contents of the didactic unit must be complete and comprehensively present the subject, while citing research, work, or publications on the subject.
13	The contents of the didactic unit include multimedia resources.	The contents of the didactic unit must take advantage of multimedia technology, rationally combining text with photos and/or audio, images, and videos, among other media.
14	The contents are presented in a visually attractive manner and attract the student's attention.	The contents of the didactic unit must attract the student's attention. The contents should be visually attractive (i.e., they should include charts, figures, and graphs in color).
15	The contents of the didactic unit respect copyright laws.	Plagiarism should be avoided in the contents of the didactic unit. Authors should not be cited without presenting the source of the cited information.
16	The didactic unit contains a closing summary of the contents.	The didactic unit must contain information that summarizes all of the studied subjects.
	Bibliography	
17	The didactic unit contains a basic bibliography.	The didactic unit must contain the references of the texts cited therein.
18	The didactic unit contains an additional bibliography.	The bibliography must be divided into basic bibliography and additional bibliography, so that the student can expand their knowledge on the topics covered in the unit.

19	A minimum of 25% of the recommended bibliography should have been published in the past 5 years.	A bibliographic review should identify what is currently known on the subject. A minimum of 25% of the additional bibliography should have been published in the past 5 years.
	Other elements to support the learning process	
20	The didactic unit contains a glossary.	At the end of the didactic unit, basic and new terms introduced in the unit must be defined and clarified.
21	The didactic unit contains a set of learning activities.	The didactic unit must propose activities in order for the student to verify the knowledge they have acquired.
22	The didactic unit contains a set of self-assessment activities.	The didactic unit must include self-assessment activities that allow the student to determine their progress in the learning process.
23	The didactic unit contains solutions to the self-assessment activities.	The didactic unit must contain solutions to the self-assessment activities, so that the student can resolve any doubts when completing the activities.
	Didactic guide	
24	The didactic guide presents information that allows the student to identify the program of the subject.	The cover of the didactic guide must indicate the title of the program, the center, the type (compulsory or optional), the number of European Credit Transfer and Accumulation System (ECTS) credits, the career (or training cycle) in which the program is included, and the online teacher in charge of the subject.
25	The didactic guide contains an index.	The didactic guide must include an index of the topics and the page numbers of each topic.
26	The didactic guide introduces the teacher(s) responsible for the development of the program.	The didactic guide must present the teacher(s) who will develop the online program. The presentation must include information, such as full name, academic training (bachelor's, master's, and doctoral degrees), and area of research.
27	The didactic guide includes an introduction of the program.	The didactic guide must briefly summarize the fundamental aspects of the online program.
28	The didactic guide presents the learning objectives and results to be achieved by the completion of the program.	The didactic guide must present the objectives and expected results, clearly describing what is to be achieved by the completion of the program.

29	The didactic guide includes the thematic contents of the program.	The didactic guide must include an index of the thematic contents of the program and an outline of the contents and develop the themes (or modules) of the program in more detail.
30	The didactic guide includes the teaching-learning methodology that will be implemented throughout the program.	The didactic guide must describe the methodology of the online program, the teaching and learning strategies, and the didactic materials that will be used and that will be available to the student throughout the program.
31	The didactic guide presents the learning activities that the student must complete to pass the program.	The didactic guide must include the learning activities, their schedule, and the methods of delivery for the student.
32	The didactic guide includes assessment strategies of the student's progress.	The didactic guide must describe all assessment strategies of the student's progress. In addition, evaluation and qualification criteria must be presented.
33	The didactic guide includes the basic and additional bibliography of the program.	The didactic guide must contain the bibliography of the program divided into basic (compulsory) and additional bibliography.
34	The didactic guide presents instructions on the forms of communication with the online teacher and tutoring schedule.	The didactic guide must provide students with specific instructions on the means of communication with the online teacher and the virtual and face-to-face tutoring schedule (if applicable).
	Additional didactic materials	
35	The course program offers a set of additional didactic materials.	Additional materials consist of materials that allow the student to deepen their knowledge on some of the studied topics. Reading these materials is optional.
36	The syllabus of the subject indicates a set of Web-based didactic materials.	In online education, a set of Web-based (or digital) didactic materials should be used to facilitate the teaching-learning process.
37	All of the program's didactic materials have been chosen based on clear selection criteria.	Didactic materials should be chosen according to well-defined selection criteria.
38	All didactic materials are consistent with the learning objectives of the program.	The correspondence of the materials with the learning objectives indicates their validity. The materials are valid when they favor the desired learning process and enable the achievement of the results expressed in the learning objectives.
	Technical aspects for all types of materials	

39	Ease of use	The materials should be easy to use.
40	Functioning	All materials should function well.
41	Navigation	The materials must allow the student to comfortably navigate from one to the other depending on the course format.
42	Interoperability	The materials must allow use in multiple environments and computer systems.
43	Accessibility	The materials must be accessible from the virtual campus. They must also be adapted to students with visual, auditory, or motor disabilities in order to allow them to study.

Validation of the System of Indicators

Given the limited scope of this paper, we present a summary of the qualitative validation of the indicators by the experts who determined the validity of each of the proposed indicators based on an evaluative judgment of their univocity, relevance, and importance. We also present some of the experts' comments regarding the indicators.

The results indicate that the experts considered all of the indicators to be univocal in their semantic definitions and relevant to the dimensions in which they were included. However, based on the experts' judgments of the importance of the indicators, two of the 45 indicators were eliminated because they were not considered to impact the quality of didactic materials in online education: "Variety of didactic materials and resources" and "Interactive content elements of the didactic unit." According to the experts, a greater variety is not a sign of the high quality or success of didactic materials; and students are not always required to interact, as sometimes a linear behavioral structure is designed so that students must follow from beginning to end. Table 6 presents some of the experts' comments regarding the indicators.

Table 6

Results of the Qualitative Validation of the System Indicators: Experts' Comments

Indicator	Experts' comments
1	• Apart from the curiosity that the title must arouse, it must give an idea of the content to the point of summarizing what the didactic unit will present next.
2	• We must choose the degree of detail (exhaustiveness) regarding the items to be included. It is not the same for the index to contain all of the sections of the didactic unit, as it is to contain only the most important ones so as not to make it endless.
4	• If the didactic unit is long (more than 5 pages), an index is essential.
5	• An introduction is essential. If we err there, we have a good chance that the student will skip that part and not continue reading.

	• The introduction to the didactic unit must introduce elements that are of great interest to students.
6	• It is not understood what "briefly" means. I think it is more convenient for me to summarize the content and present the objectives, learning outcomes, or at least the purpose.
9	• This indicator is basic. • The learning objectives or results will give us the competencies that the student must achieve upon completing the program.
10	• If the information is out-of-date it is not useful for learning. Furthermore, it must come from good sources.
13	• It is desirable that the didactic unit include multimedia elements. • The objective of using all of these resources must be pedagogical not just playful or illustrative.
14	• I agree with the importance of the visual attractiveness of the didactic unit in order for it to be more motivating, but it is also important to take into account the importance of the content and the need to study it thoroughly to understand it.
15	• The issue of copyright is important, not only for legal aspects, but also for the quality and reliability of the references provided.
17	• It is important that the bibliographic sources used are current, but it depends on the subject. • I am not quite sure of this statement. The sources managed by the author of the didactic unit must be current; but, depending on the subject, this requirement will be more or less critical.
21	• It's better if the activities can be corrected by the students themselves.
25	• If the didactic guide is short (4–5 pages), the index does not make sense. If it is long, the students will not read it. Here the index is convenient for the possibility of selective reading.
27	• The introduction to the program is essential to the didactic guide.
28	• If we want the didactic guide to be complete, it will be necessary to include the expected results of the learning process and the achievement indicators for each topic.
30	• The description of the teaching-learning methodology is fundamental.
31	• This aspect [learning activities] is essential in online education programs.
32	• If we want to play fair, the strategies for the assessment of the learning results must be described in the didactic guide.
33	• The bibliography must be reasonable in terms of the documents it includes, both when it comes to basic bibliography, as well as additional bibliography.
35	• These resources, included in the didactic unit as part of its additional activities, are essential to online training. The content, in this way, is not limited to the didactic unit.
36	• It is important that a set of Web-based didactic materials and resources are indicated, but it can greatly complicate resource selection.
38	• It is obvious that the didactic materials are consistent with the learning objectives of the program. But since they are complementary to the didactic unit, the range of objectives can be extended and go beyond those formulated in the didactic unit.

The experts' validation allowed us to refine and improve the system in accordance with their comments.

Implications and Conclusion

The quality of didactic materials is the primary factor that shapes the perception of online learning and content engagement among online course participants. In order for didactic materials to be of high quality, the persons involved in developing them (e.g., authors, designers, and teachers) should consider the quality aspect from the outset of the development process. Online education applies a variety of didactic materials; however, online teachers, students, and designers who create, modify, and use these materials may not know whether they are of high quality and whether they meet the minimum requirements for online education (Marciniak, 2018; Vizoso, 2018).

A number of authors have designed models to help create and assess didactic materials for online education. However, "there is no basic agreement among them regarding the indicators to be applied when creating and assessing these models" (AENOR, 2017, p. 45). Furthermore, the models do not include specific indicators to assess all of the elements of the didactic materials used in online education. A system of indicators to assess these didactic materials in a comprehensive manner is, therefore, needed. The system of 43 indicators presented in this paper allows users to assess the quality of three types of didactic materials most commonly used in online education: didactic guides, didactic units, and additional didactic materials. The trial application of this system to assess five online didactic materials used by universities in different countries allowed us to verify its utility and great potential to improve the quality of such materials. However, the system is not static; it allows for dynamic implementation based on its evolution through adaptation, removal, and/or incorporation of new indicators. Application of the system depends on the needs of each university; and, it can be applied by designers, teachers, and users as a guide to create, select, and assess the quality of the three types of didactic materials used in online education.

Future Research

The proposed system provides a framework for future research. Some of the aims of this research are,

- To apply the proposed system to a select sample of didactic materials used by universities in different countries in order to identify which indicators remain stable and which can be adjusted to the specific context of each university.
- Given the variability of the conditions in which online didactic materials are created and used, the need for research to adjust the system to the specific context of each university is justified.
- To undertake a comprehensive analysis of the system indicators in existing standards and models designed to assess didactic materials for online education; as, upon analyzing these models, we have identified different meanings assigned to them by each author.

Research Limitations

In all research processes, it is common to encounter constraints that the researcher must overcome in order to achieve the research objectives. A number of constraints were encountered in this research:

- The scarcity of literature regarding the quality of online didactic materials limited the breadth of the bibliographic research conducted.

- The analysis of the indicators in existing models and standards was general. Nevertheless, a more detailed analysis of each indicator, document, process, and other characteristics was necessary.

- Of the 25 experts who were invited to participate in the validation of the system, only 16 experts participated.

Nonetheless, the difficulties listed above did not hinder the development of the research or limit its thoroughness, and thus the results of the research are supported by the framework of the analysis conducted.

References

Asinsten, J. C. (2011). *Producción de material didáctico en ambientes virtuales de aprendizaje* [Production of didactic material in virtual learning environments]. Virtual Educa. https://virtualeduca.org/documentos/manual_del_contenidista.pdf

Bautista Liébana, J. R., Martínez Romero, R., & Sainz Ibáñez, M. (2001). La evaluación de materiales didácticos para la educación a distancia [The evaluation of didactic materials for distance education]. *Revista Iberoamericana de Educación a Distancia*, *4*(1), 73–95. http://revistas.uned.es/index.php/ried/article/view/1192/1095

Blanco Gil, R., Casado García, L., Martín Ruiz, F. J., Mediano Villanueva, F. J., Ramos Ruiz, J., & Utiel Ortega, C. (2010). *Didáctica de la tecnología* [Teaching technology]. Grao.

Bravo Ramos, J. L. (2005). *Elaboración de materiales educativos para la formación a distancia* [Development of educational materials for distance learning] Instituto de Ciencias de la Educación (ICE) UPM. http://www.ice.upm.es/wps/jlbr/Documentacion/Libros/Elabora_mat_img.pdf

Cepeda Romero, O., ; Gallardo, I. M., & Rodríguez Rodríguez, J. (2017), La evaluación de los materiales didácticos Digitales [The evaluation of digital didactic materials]. *Revista Latinoamericana de Tecnología Educativa*, *16*(2). https://doi.org/10.17398/1695-288X.16.2.79

Espinoza, O., & González, L. E. (2006). Procesos universitarios dinámicos. El modelo de gestión de la calidad total [Dynamic university processes. The total quality management model]. *Calidad de la Educación*, *1*(24), 15–34. http://dx.doi.org/10.31619/caledu.n24.265

Fernández-Pampillón Cesteros, A. M., Domínguez Romero, E., & Armas Ranero, I. (2012a). *Guía para la producción y evaluación de materiales didácticos digitales* [Guide for the production and evaluation of digital didactic materials]. Universidad Complutense de Madrid. https://eprints.ucm.es/id/eprint/12533/1/COdAv1_1_07jul2012.pdf

Fernández-Pampillón Cesteros, A. M., Domínguez Romero, E., & Armas Ranero, I. (2012b). Diez criterios para mejorar la calidad de los materiales didácticos digitales [Ten criteria to improve the quality of digital didactic materials]. In A. Sanz Cabrerizo, J. A. López Orozco, & A. Baratas Díaz (Eds.). *VII jornadas de campus virtual UCM: valorar, validar y difundir campus virtual* (pp. 25–34). Universidad Complutense de Madrid. https://eprints.ucm.es/id/eprint/20297/

García Aretio, L. (2014). *Bases, mediaciones y futuro de la educación a distancia en la sociedad digital* [Bases, mediations, and future of distance education in the digital society]. Sintesis.

García Martín, A., Briones Peñalver, A. J., Busquier Sáez, S., García Cascales, M. S., De Miguel-Gómez, M. D., Mulas Pérez, J., Pérez García, J., Vicente Chicote, C., García Sanchez, A. J., Martínez Conesa, E. J., Serrano Martínez, J. L., Pérez Pérez, J., & Sánchez Pérez, L. Á. (2010). *Manual de elaboración de guías docentes adaptadas al EEES*. [Manual for preparing teaching guides adapted to the EEES]. Universidad de Cartagena.

https://repositorio.upct.es/xmlui/bitstream/handle/10317/1747/isbn9788469350317.pdf

Hyla, M. (2016). *Przewodnik po e-learningu*. [A guide for e-learning]. Wolters Kluwer.

Illum Hansen, T., & Toke Gissel, S. (2017). Quality of didactic materials. *IARTEM e-Journal*, *9*(1), 122–141. https://doi.org/10.21344/iartem.v9i1.601

Marciniak, R. (2016). *Autoevaluación de programas de educación universitaria virtual* [Self-assessment of higher virtual education programmes] (Doctoral dissertation). Autonomous University of Barcelona, Barcelona, Spain.

Marciniak, R. (2017). A methodological proposal for the Project design of the online course: Pilot application. *APERTURA. Revista de Innovación Educativa*, *9*(2), 74-95. http://www.udgvirtual.udg.mx/apertura/index.php/apertura/article/view/991/797

Marciniak, R. (2018). Quality assurance for online higher education programmes: Design and validation of an integrative assessment model applicable to Spanish universities. *The International Review of Research in Open and Distributed Learning 19*(2), 126-154. http://www.irrodl.org/index.php/irrodl/article/view/3443

Marzal, M. A., Calzada-Prado, J., & Vianello, M. (2008). Criterios para la evaluación de la usabilidad de los recursos educativos virtuales: un análisis desde la alfabetización en información. [Criteria for evaluating the usability of virtual educational resources]. *Information Research*, *13*(4), 387. http://informationr.net/ir/13-4/paper387.html

Morales Morgado, E. M., García Peñalvo, F. J., & Olmos Migueláñez, S. (2010). Diseño de objetos de aprendizaje para potenciar el desarrollo de competencias y su evaluación con

HEODAR [Design of learning objects to enhance the development of skills]. J. Sánchez (Ed.). *IE 2010, Segundo Congreso Iberoamericano de Informática Educativa* (pp. 683–690). Universidad de Chile. http://www.tise.cl/volumen6/TISE2010/Documento97.pdf

National Agency for Quality Assessment and Accreditation (ANECA). (2019). *Guide to self-evaluation: Ex post accreditation for official Bachelor's Degrees, Master's Degrees and Doctoral Degrees ACREDITA Procedure*. ANECA. http://www.aneca.es/eng/content/view/full/12612

National Distance Education University of Spain. (n.d.). *El protocolo de evaluación de materiales didácticos a distancia* [The evaluation protocol for distance learning materials]. http://www.uned.es/iued/subsitio/html/documentos/Protocolo_MADI.pdf

Nesbit, J. C., Belfer, K., & Vargo, J. (2002). A convergent participation model for evaluation of learning objects. *Canadian Journal of Learning and Technology*, *28*(3), 105–120. https://doi.org/10.21432/T25C8C

Nielsen, J., & Morkes, J. (1998). *Applying writing guidelines to Web pages*. Nielsen Norman Group. https://www.nngroup.com/articles/applying-writing-guidelines-web-pages/

Opdenacker, L., Stassen, I., Vaes, S., Waes, L., & Jacobs, G. (Eds.). (2009). *QuADEM:Manual for the*

quality assessment of digital educational material. University of Antwerp.

Padrón, C., Díaz, P., & Aedo, I. (2006). MD2 method: The didactic materials creation from a model based perspective. In: W. Nejdl & K. Tochtermann (Eds.), *Innovative Approaches for Learning and Knowledge Sharing*. *Lecture Notes in Computer Science* (vol. 4227, pp. 366–382). Springer. https://doi.org/10.1007/11876663_29

Rodríguez Rodríguez, J., & Martínez Bonafé, J. (2016). Libros de texto y control del currículum en el contexto de la sociedad digital. *Revista Latinoamericana de Tecnología Educativa*, *16*(2), 79–95. https://doi.org/10.17398/1695-288X.16.2.79

Rushby, N., & Surry, D. (2016). *Wiley handbook of learning technology*. John Wiley and Sons. https://doi.org/10.1002/9781118736494

Shattuck, K. (2014). *Assuring quality in online education: Practices and processes at theteaching, resource, and program levels*. Sterling: Stylus Publishing.

Spanish Association for Standardization and Certification (AENOR). (2017). *UNE 71362. Calidad de los materiales educativos digitales* [UNE 71362. Quality of digital educational materials]. Madrid: AENOR.

Vizoso, C. M. (2018, November 29). *Calidad de los MED: Materiales educativos digitales*[Quality of the Digital Educational Materials]. Global Campus Nebrija. https://www.nebrija.com/medios/nebrijaglobalcampus/2018/11/29/calidad-de-los-med-materiales-educativos-digitales/

Vlachopoulos, D. (2016). Assuring quality in online course design: The roadmap. *The International Review of Research in Open and Distance Learning*, *17*(6), 183–205. http://dx.doi.org/10.19173/irrodl.v17i6.2784

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Learners' Perception of the Transition to Instructor-Led Online Learning Environments: Facilitators and Barriers During the COVID-19 Pandemic

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Abstract

Online learning environments (OLE) continue to expand due to the COVID-19 pandemic and the transition of a majority of educational institutions and universities worldwide from traditional classroom settings to online learning methods. The purpose of this study was to understand the perceptions of learners at a university in India toward the sudden transition from traditional face-to-face learning to an instructor-led OLE due to the pandemic-induced lockdown enforced across India in March 2020. Using a qualitative case study approach, structured interviews were conducted via Microsoft Teams with 35 learners from Savitribai Phule Pune University, a large public university in India. Interviews comprised eight open-ended questions, which were validated by experts. Results indicate that learners accepted the transition toward the OLE. Five key themes arose from the interview data: accessibility and comfort, Internet connectivity, OLE effectiveness, course content, and interactions between students and instructors. The study provides insights to the researchers with the emergent themes from the research. Also, it carries practical implications concerning implications regarding infrastructure readiness for remote learners, acceptance, and adoption of OLEs by faculty instructors, organizational support, and facilitating conditions.

Keywords: online learning environment, OLE, learner perceptions, COVID-19, pedagogical issues, learning dynamics, India

Introduction

The COVID-19 pandemic has led a majority of universities/educational institutions across the world to switch to online learning pedagogies. Nationwide lockdowns, which have been imposed in many countries, have resulted in the closure of university and college campuses and a transition toward online learning. Beginning in March 2020, many countries including India have practiced strict lockdown measures. India imposed a complete lockdown on March 24, 2020 (Gettleman & Schultz, 2020; Press Information Bureau, 2020), which resulted in the closure of educational institutions, universities, and colleges across the country, significantly impacting academic activity (Sharma, 2020). As Sharma (2020) asserts, the pandemic is paving the way for a paradigm shift in the Indian education system, with the accelerated adoption of digital technology. Some experts in India consider online education a contingency measure and not a long-term strategy (Agha, 2020). Academic institutions are challenged to adapt to changing demands in the short term, while maintaining the effectiveness of session delivery.

As businesses and the economy have been affected by the pandemic (Romei, 2020; Walker, 2020), so too has the education community (Alexander & Kwatra, 2020; John et al., 2020). The education sector has been required to transition to an online learning environment (OLE) to meet learner needs and ensure the continuity of curriculum and learning processes. The transition to OLEs has not been without challenges, as many institutions and learners depend on the availability of online learning platforms. Understanding OLEs plays a crucial role in delivering quality education and enhancing learners' knowledge. The quality of OLEs involves various factors, including Internet connectivity, access to technology, infrastructure to conduct sessions, participation and interaction of learners and faculty instructors.

According to Hofmann (2002), online learning has gained increased importance due to the availability and accessibility of Internet technologies. Learning environments differ in their design and execution depending on learning objectives, target audience, access (physical, online, and/or both), and content type (Moore et al., 2011). Based on delivery method, the most popular learning environments are distance learning (Keegan, 2013; King et al., 2001; Moore, 1990), e-learning (Nichols, 2003; Tavangarian et al., 2004; Triacca et al., 2004), and online learning (Carliner, 2004; Lowenthal et al., 2009; Oblinger & Oblinger, 2005). As an instructional delivery system, distance learning offers learners the opportunity to participate in courses and programs from remote locations with the help of Internet technology. Distance learning opportunities have had a profound impact on beliefs about learning and teaching (Zapalska & Brozik, 2006). OLE can be instructor-led, self-paced, or self-directed depending on the delivery method (Moore, et al., 2011). In this study, the researchers focused on instructor-led OLE.

The COVID-19 pandemic has reinforced the importance of technology and virtual learning in education. While OLEs provide learners with numerous benefits, the sudden shift to a virtual environment due to the pandemic requires detailed study. The purpose of this study was to understand the perceptions and concerns of learners at Savitribai Phule Pune University, India, who are accustomed to traditional face-to-face learning, toward the sudden transition to online learning in March 2020 due to the pandemic, as well the impact of this transition on their learning. The authors addressed the following research question, what is traditional learners' perception of online learning and what is its acceptability in India, in the context of the shift to OLEs due to the COVID-19 pandemic?

Online Learning Environments (OLEs)

OLEs have been described as access to learning experiences through the use of technology (Benson, 2002; Carliner, 2004; Conrad, 2002). Dhawan (2020) defines online learning as "learning experiences in synchronous or asynchronous environments using different devices (e.g., mobile phones, laptops, etc.) with Internet access". Current literature focuses on the benefits of online learning platforms where learners can access classrooms from anywhere. Previous studies have also identified the benefits of OLEs from the learners' perspective (Chakraborty & Nafukho, 2014). Benefits of OLEs include enabling participation from across the world (Baker et al., 2009); improving computer skills due to the computer-mediated classes (Robinson & Hullinger, 2008); facilitating critical thinking and practical application of knowledge (Chen, 2014); and providing opportunities for use of higher-order skills, such as problem-solving and collaboration (Duderstadt et al., 2002).

Although technological innovations have created diverse options for OLEs (Amirault, 2015), the shift from the familiar traditional face-to-face learning environment poses challenges to the instructor as well as the learner due to the complex nature of the OLE (Chakraborty & Nafukho, 2014). Researchers have argued that online and distance learning environments are not adequate in developing learners' generic competencies, a primary concern for educators (Gvaramadze, 2012). Furthermore, learners interact and engage differently in virtual learning environments compared with face-to-face settings, which alters their learning outcomes (Harris & Nikitenko, 2014). Instructors' reduced interaction with learners and the lack of immediate feedback and response complicate the situation (Littlefield, 2018). Studies have emphasized that OLEs require a different pedagogy and set of skills from traditional classrooms (Boling et al., 2012).

Recent studies in the United States concerning the shift to online and digital learning platforms, due to the COVID-19 pandemic, focus on schools (Reich et al., 2020), the use of online learning to complement traditional learning modes (Barboni, 2019), the use of flipped classrooms, online practice sessions, and teleconferencing for resident medical students (Chick et al., 2020), and best practices for developing courses using OLEs (Sun & Chen, 2016). Educators in developing countries are faced with the necessity to transition to online teaching with minimal or no training. Furthermore, classroom sizes in developing countries are generally larger than in developed countries, and OLEs make classroom monitoring and communication with *all* learners challenging. In India the situation is particularly difficult due to the large number of learners and inadequate technological and communication infrastructure. The prevalence of the Internet in India has grown over the years, but Internet speed and connectivity remain unreliable with fluctuations occur depending on the area and region. Furthermore, both learners and instructors lack the laptops, printers, Webcams, and speakers required for online learning.

Methodology

The study adopted a qualitative case study approach (Johnson & Christensen, 2019), to explore the phenomenon based on practical real-life scenarios (Merriam, 1998). The study focused on the experiences of learners in the transition to online learning during the COVID-19 pandemic and the closure of all educational activities across India.

Participants

Participants in this study were students pursuing a master's degree in business administration at a business school affiliated with Savitribai Phule Pune University, a public university in the city of Pune, the second-largest city in the state of Maharashtra and the eighth-most populous city in India. All participants studied full-time and were not employed while enrolled in the program. At the time of the study, the learners were in the second of four semesters in the program. With the enforcement of a lockdown in March 2020 across India due to the pandemic, classroom teaching at the business school was cancelled, and the remainder of the course syllabus was delivered through an OLE, on platforms such as Microsoft Teams. Interviews were conducted with the participants at the completion of the second semester in mid-April 2020. A total of 35 learners participated in the study. More than half of participants were male (57.14%) and 42.86% were female; 80% of the participants were between the ages of 21 and 24 years old and 20% were between the ages 25 and 30 years old. Participants used either a smartphone (65.71%) or a personal computer/laptop (34.28%) to attend classes online during the lockdown.

Data Collection

Structured interviews were conducted with 35 learners via Microsoft Teams. Participants were asked eight open-ended questions on the transition to OLE due to unforeseen circumstances and their perspectives on teaching and learning in a technology-mediated environment (Table1). The interview questions were validated by a panel of experts from the university: three faculty members and two students, who had been actively engaged in online learning in the previous 3 months. Two of the faculty members were experts in information technology and had been responsible for setting up the online learning platform at the institute. A pilot study was also conducted to assess the appropriateness of the interview questions with a sample of four learners. An iterative process was conducted to establish the reliability and face validity of the questions.

Table 1

Interview Questions Protocol

	Interview questions
1.	What were your experiences transitioning from a face-to-face learning environment to an OLE?
2.	Do you feel there were any skills you lacked that may have helped you make the transition to online instruction?
3.	What skills from the face-to-face learning environment do you think transferred directly to learning effectively in the OLE?
4.	What do you think are the strengths and weaknesses of online sessions conducted by the institute?
5.	Did the faculty encourage learners to contribute to collective knowledge?
6.	Did the faculty accommodate and support learners with different learning needs?
7.	Did the present social situation and characteristics in the country discourage learners from participating in the online sessions?
8.	Comment on your ability to find and manage time effectively to participate in online sessions.

Data Analysis

Interviews were transcribed and initial coding was conducted using NVivo software, which led to the identification of patterns, categories, and relationships among the codes. A total of 15 categories were identified in the interview data. The categories were further analyzed and five key themes emerged.

Findings

The increased risk of infection due to the COVID-19 pandemic and the restrictions imposed on the movement of individuals by the regulatory bodies across India impeded classroom teaching. In the interviews, participants shared their perceptions on the shift to an OLE at their university due to the pandemic and the benefits and challenges of online learning. Five themes emerged from the analysis of the participant interviews: accessibility and comfort, Internet connectivity, OLE effectiveness, course content, and interactions between learners and instructors.

Accessibility and Comfort

Accessibility and comfort were a prominent theme in the participants' responses to the interview questions. The word "accessibility" is defined as the quality of being able to easily reach and use (Kulkarni, 2019). The quality of comfort is twofold. It refers both to comfort or ease in using the technology and the comfort arising from the flexibility of place and time in accessing the online content. Online teaching helped learners easily reach their classes at any time and from anywhere. The participants preferred the OLE to traditional classroom learning as it provided them with easy access to the course content and the comfort of learning from home. Some of the participants' responses are presented below.

> Joining a session is just a matter of click. We could get connected to a session in the ease of being in our bedroom/study room. Planning a day becomes easy as it saves travel time/session organizing, accommodating time. (Participant 13, female)

> As I know my session starts at 10, I connect to the meeting 5 minutes before. No, there were no issues with time management. It is so comfortable. (Participant 15, male)

> The main advantage of online learning is that students can participate in classes from anywhere in the world provided they have a computer and an Internet connection. Besides, the online format allows physically challenged students and teachers more freedom to participate in class. Participants access the virtual classroom through their computers instead of having to go to class physically. (Participant 18, male)

> Convenience is a major benefit of online education. (Participant 7, male)

The learners mentioned that prior to the transition to the OLE, they went to the university even for a single class, wasting a major part of their day in unproductive travel time. Online learning made attending classes convenient, saving learners both the time and energy. However, the positive impact of accessibility is, to a certain extent, mitigated by the fragile Internet connectivity in many parts of the

country. For the classes to be truly comfortable and accessible, access to reliable Internet connectivity is required.

Internet Connectivity

Participants emphasized the importance of having a computer and Internet connectivity to participate in the online classes. Having a desktop, tablet, smartphone, or laptop and access to the Internet with unhindered, seamless connectivity are required for learning in online environments. Most of the participants (n=32) stated that Internet connectivity was one of the biggest barriers to their online learning. Due to fluctuations in Internet connectivity across the geographical locations in which the participants resided, effective online learning was not always possible, resulting in reduced learner motivation; and, in some cases, learners were unable to attend classes, especially from remote locations, such Amravati, Jalgoan, Ratnagiri, and Raigarh. The learners pointed out that the technological limitations arising from poor network connectivity, and glitches in the audio/video functions due to low network speed, were a major cause for lack of motivation. Low Internet speeds resulted in loss of microphone and speaker functions, with negative impact on learner attention and motivation, rendering the teaching and learning process ineffective.

> The biggest lack of motivation to attend lectures is from technological limitations due to the reliability of Internet connectivity. Poor network, glitches in the audio/video make it hard to link the topic and the voice of the lecturer, which causes the lecture to be ineffective and hard to understand. Too much noise in the background make it hard to concentrate in the lecture. Too much mail in the email inbox regarding the lecture schedules and invites. Everything gets piled up, and it makes it so hectic. Some students feel that online lectures consume a lot of Internet data, which they have to reserve for the rest of the day. (Participant 27, female)

> [The OLE] is good but a little bit of distraction and technical issues due to network problems create hurdles between classes. (Participant 14, female)

> We are on time to attend the session, but the Internet connection stability went the wrong way many times. (Participant 30, male)

> Some students want to connect and learn but are not able to because they don't have that much Internet access or have connectivity problems in their area. (Participant 29, male)

> Being in a hometown, which is a small village, there's always this problem of Internet connectivity. So here we need to find certain places where Internet connectivity is good enough to attend online sessions. Otherwise, as far as theoretical subjects are concerned, there are no major drawbacks as platforms like zoom are quite good enough for teaching activities. (Participant 34, female)

> Online sessions are needed for the current situation during this lockdown. It will help students to complete their academic requirements and also enable the use of technology for the right purpose. This comes under strengths. While many students are from a rural background, Internet services, bad network connections, technical issues are some weaknesses of online sessions. (Participant 24, female)

As the research was conducted during the ongoing lockdown in India, the learners were sensitive toward the imposed restrictions on the movement of the instructors and considered OLEs the need of the hour. The shift to online learning enabled the completion of academic requirements, but the learning process was hindered by the lack of or poor Internet connectivity. A reliable Internet connection was seen as a basic requirement for uninterrupted sessions. The constant disturbances caused due to poor connectivity had negative impact on the effectiveness of the OLE.

OLE Effectiveness

The majority of participants (n=30) commented on the effectiveness of the OLE; however, their views were significantly divided. While some participants opined that online learning was more constructive than traditional learning and helped them concentrate better, some participants considered OLEs ineffective. Thus, this theme is divided into effective learning environment and ineffective learning environment.

Effective Learning Environment

Compared with traditional classroom learning, the OLE presented learners with unique benefits. Some participants mentioned that online learning afforded better focus on learning without the nuisance created by mischievous learners in traditional classroom environments or external disturbances.

> Online teaching makes students' misbehavior/disturbances and the audibility problems of classrooms into exceptions. (Participant 2, female)

> Online teaching enables every student or member of the online meeting to listen to what the teacher or host is saying personally, hence everything that is taught is absorbed by the students to the fullest as there are no external disturbing factors to the concentration. (Participant 8, male)

Another participant added that the OLE improved the visibility and clarity of visual learning aids:

> The presentation visuals, which used to be unclear to all the corners of the classroom/hall…are now visible and crystal clear due to the screen sharing feature of online teaching. The faculty's teaching are disturbed less (apart from the technical issues), which enables them to teach smoothly. (Participant 3, male)

Ineffective Learning Environment

Some participants highlighted the shortcomings of the OLE, including Internet connectivity issues and lack of one-on-one discussions and clarification with the instructor. Some participants believed that the sessions turned into instructors' one-way communication and that the teaching materials were not effectively presented. Another aspect that the participants pointed out was learners' inability to concentrate in the sessions due to the many distractions they encountered and the instructors' lack of control in the online environment.

> Not every student can clear their doubts; there are disturbances in audio and in the network…. there's no whiteboard where the topics are explained in a flowchart. Online there is just the screen and PowerPoint slides, and the main problem occurs when it comes to numerical topics.

> During lectures, our Wi-Fi or data is ON so there's a lot of notifications, messages pop up, so there is a chance to get disturbed a lot. (Participant 17, female)

> Few students can give 100 percent to online sessions, but there is a lack of seriousness about online sessions for many students because in-class teachers aware of students' concentration but here in online sessions it is not possible to give attention to students; and distractions from study because of the current situation are possible because there may be negativity in students' mind about their future career. (Participant 21, female)

> Sometimes it's difficult to concentrate as one is home. And the feeling of seeing face-to-face and virtual makes a big difference. The seriousness sometimes is lacking as there are distractions. (Participant 23, female)

> The ambiance of the classroom is what I miss as that environment helps me personally to think more. (Participant 26, male)

While Participant 26 found the OLE effective in many ways, he preferred traditional classroom learning. The effectiveness and ineffectiveness of OLEs is also entangled with the kind of course that is being taught.

Course Content

Even the participants who agreed that online learning is effective stated that numerical or practical classes were difficult to understand online. A general notion arising from the interviews highlights the suitability of online learning for theoretical courses and not for practical courses involving numerical concepts.

> For a theoretical subject there are no problems; but for the numerical part, it is a bit difficult but still manageable. (Participant 1, male)

> As for numerical, it is getting difficult to understand. (Participant 25, female)

> Subjects like accounts, it is hard to understand in an online platform. Even for commerce students. (Participant 27, female)

> It feels good to learn through online platforms, theoretical subject learning is good.... But, yes, numerical subjects can face some issues; it's okay, our faculty are supporting us with everything possible: notes, a question bank, assignments, presentation, practice problems, etc. (Participant 29, male)

Participant 29 clarifies an important point regarding online teaching: Ultimately, ineffective classes can be made effective with constructive teacher-learner interactions.

Interactions Between Learners and Instructors

It was a consensus among the learners that the physical absence of the faculty instructor mattered most to them. The participants felt the connection between the learner and the instructor was missing in the

OLE. Due to the physical distance, learner participation was negatively impacted, leading to one-way communication of the instructor.

> The online class is not participative as compared to face-to-face teaching. (Participative 23, female)

> The classes online become very boring sometimes. It is not as interactive and lively as classroom teaching. (Participant 31, male)

> I just doesn't feel it's a class. Most of the time all cameras are off, microphones are off; we hear only what the teacher says, or if one student answers. It seems we are listening to the radio. (Participant 32, male)

Furthermore, learner participation was hampered due to the challenges faculty instructors faced in seamlessly delivering sessions and courses using the online interface as well as difficulties the learners experienced themselves.

> Many faculties find an issue with the interface of the applications used. There is not much effective control as it could be in a [physical] class. (Participant 19, male)

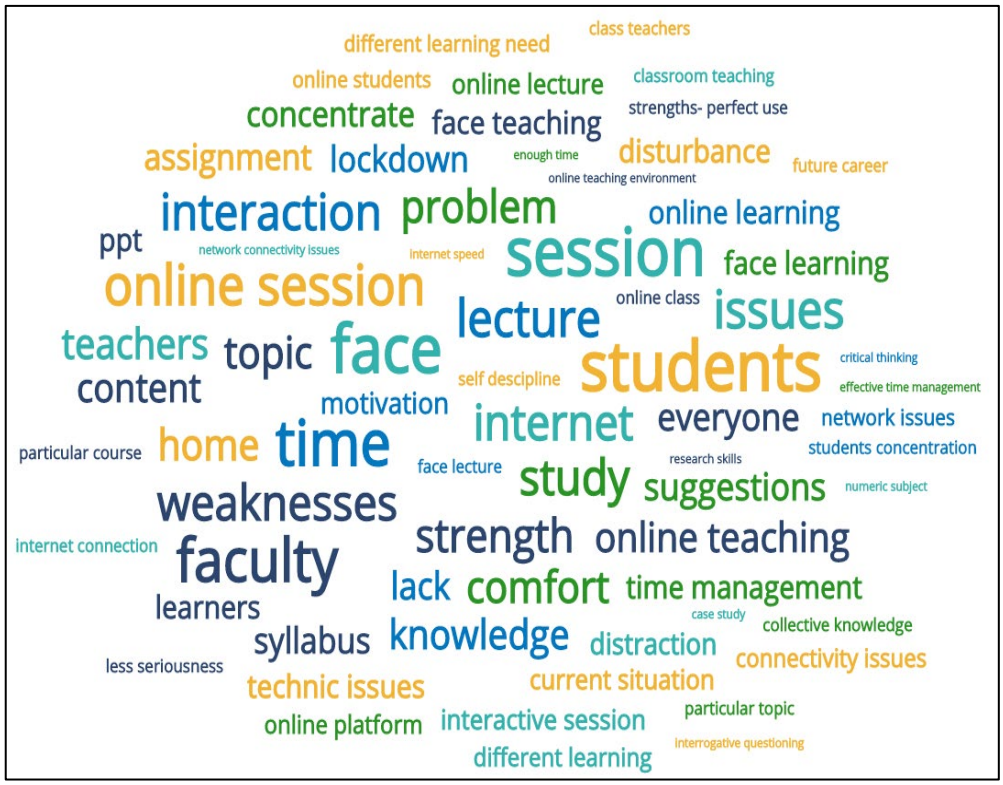
> The online environment is very convenient but sometimes it creates a problem due to people not able to understand the user interface. (Participant 1, male)

The OLE caused barriers to participation, which led to a diminished experience of the connection between students and instructors. As participant 32 mentioned, the digital setup seemed to lead to a lack of interest among learners with negative impact on their connection with instructors.

A word cloud formed using keywords from the participants' interview responses are presented in Figure 1. The frequency of the participants' use of the keywords is reflected in the size of the words in the figure. The larger the word, the more frequently it was used. The participants used words like faculty, face-to-face, session, and interaction quite often during the interviews. This shows an increased inclination towards the face-to-face interaction over the online mode of teaching. The importance of faculty members cannot be negated in the online learning environment either. Subsequently, online teaching, internet, comfort, content, and topic were the interviews' highlighted words. Closer inspection with participants' responses revealed that students were apprised about the pandemic situation and accepted the online mode of teaching. Nevertheless, the content and topic of discussion weighed in on online teaching and internet connectivity at their locations.

Figure 1

Word Cloud of the Keywords Participants Used Regarding OLEs



Note. The word cloud was created using free online tool available at: www.wordclouds.com.

Discussion

The study focused on learners' perceptions of the sudden shift from the traditional learning environment to an OLE, due to the COVID-19 pandemic, and the perceived benefits and challenges of the OLE. Five themes emerged from the analysis: accessibility and comfort, Internet connectivity, effectiveness of the OLE, course content, and interactions between the learners and the instructors. The themes that emerged in this study are similar to the findings of earlier studies and, at the same time, are unique to the geographical context of the study: the city of Pune, the second-largest city in the state of Maharashtra, the commercial capital of India.

Accessibility and comfort facilitated the learners' participation in online learning but also hindered it many times. The importance of accessibility and comfort in the OLE has been identified in earlier research as well (Hill, 2002; Hung et al., 2010; Kebritchi et al., 2017). Making technology accessible, and integration across the platform, is an important element in the success of online learning (Hooper & Rieber, 1995).

Internet connectivity and Internet access are considered an integral part of online learning, and the results of this study coincide with earlier studies in this area (Li & Irby, 2008; Luyt, 2013). Impaired

Internet connectivity negatively impacted learners' motivation, which, in turn, impacted their participation and success in the OLE.

Effectiveness of the OLE. Some of the participants were concerned about the effectiveness of the OLE in terms of their participation in and their ability to contribute to the class discussions. Deterrents to the online learning environment posed a threat to the participants learning due to lack of internet connectivity, the interaction between faculty instructor and participant, and absence of human contact between the instructor and learner. The findings supported the analysis by Gvaramadze (2012) as physical distance between the instructor and learner does not aid in developing the participants' core competencies in case of developing countries. The reduced response and participation between the faculty instructors and the learners complicate the situation, thus supporting the earlier work by Littefield (2018). Such factors hinder the learning process and thus proving detrimental to the effectiveness of OLE.

Course content also influenced participants' perceptions of the effectiveness of the OLE. The study emphasizes the difficulty participants experienced in comprehending courses that involve numerical content and theorems, which concurs with the findings of previous studies (Ko & Rossen, 2017; Limperos et al., 2015).

Interaction between learners and instructors was impaired due to the OLE. The participants indicated the physical presence of a faculty instructor cannot be negated by the use of technology as it is central to their success or failure in a course. This result concurs with earlier studies on faculty instructors (Garrison et al.,1999; Richardson et al., 2016; Stone & Chapman, 2006). The feature of instructors' physical presence has significant influence on learners' participation in a course, a feature that loses ground in the OLE (Jorge, 2010; Tao, 2009). Similar to previous studies (Ali et al., 2018; McInnerney & Roberts, 2004; Szeto & Cheng, 2014), learners in this study expressed feelings of disconnect in the online classroom. Due to the increased interaction between the instructor and the technology, coupled with the interaction between learners and the technology, the participants were often frustrated, and thereby the effectiveness of the session was reduced.

Finally, the participants provided favorable responses regarding the transition to the OLE due to the COVID-19 pandemic and the lockdown in India, which forced instructors to switch to OLEs in a short time. Learners' favorable views of the rapid transition to OLEs have been found in similar studies conducted in other geographical settings (Basilaia & Kvavadze, 2020; Chick et al., 2020; Reich et al., 2020).

Conclusion and Implications

This study offers several theoretical and practical implications. This is the first study to explore the transition to OLEs in a higher education institution, in the context of management/business education, in a developing country due to a pandemic or disaster. The sudden transition toward OLEs due to the COVID-19 pandemic has posed several challenges in developing countries, such as India, including lack of Internet connectivity, access to technological platforms by learners and instructors, familiarity with online teaching and learning approaches, and adoption of technology. From a theoretical perspective,

this study provides insight into a specific geographical context and contributes to understanding the nature of online learning in different settings and its acceptance and adoption among learners and the instructors who are accustomed to teaching and learning in traditional classrooms. The study offers insight into the role of technology in the delivery of online learning modules and courses to learners in remote locations. Reliance on technology and lack of continuous Internet connectivity hinder the transition of learners toward online learning in developing countries, such as India.

In addition, the study has practical implications regarding infrastructure readiness for remote learners, acceptance and adoption of OLEs by faculty instructors, organizational support, and facilitating conditions. Remote learners spread across the country do not get seamless access to internet connectivity due to lack of infrastructure, thus posing limitations for the higher education institutions to reach out to the students in the online learning environment and hampering their learning. This leads to dissatisfaction among the learners and poses a threat to higher education institutions as seamless internet connectivity is outside their control. The acceptance of OLE by faculty instructors further diminishes the dissemination of knowledge among learners. The educational institutions need to support the seamless adoption of OLE by the faculty instructors and students alike. The higher education institutions can provide guidance and training to their faculty instructors to adopt OLE and educate the learners in turn. The study identified five themes in participants perceptions of the sudden transition toward an OLE: accessibility and comfort, Internet connectivity, OLE effectiveness, course content, and interactions between students and instructors. Participants' responses may have been favorable because the transition toward the OLE was due to the outbreak of the COVID-19 pandemic. Yet, despite the favorable responses, the study offers important conclusions related to the themes identified and the geographical context of the study. This qualitative study of the perceptions of learners toward OLEs in India provides a better understand the shortcomings and benefits of OLEs in developing countries. Quantitative studies on the acceptance of online learning in developing countries are warranted.

The study conclusions are based on research conducted within the geographical region of Pune city in India, and the study sample was limited to a small number of participants pursuing a master's degree in business administration at Savitribai Phule Pune University. Further research should be conducted in other geographical areas in India with a larger sample. The implications of the study are also applicable to OLE implementation in post-pandemic scenarios in developing countries. Further research should be directed toward addressing the issues raised in this study (e.g., Internet connectivity, course content, and interaction between instructors and learners) to improve the delivery of OLEs in developing countries, such as India.

References

Agha, E. (2020, April 17). *Online education a contingency measure during Covid-19 lockdown and not long-term strategy, say experts*. News18. https://www.news18.com/news/india/online-education-a-contingency-measure-during-covid-19-lockdown-and-not-long-term-strategy-say-experts-2581297.html

Alexander, S., & Kwatra, N. (2020, April 6). *In fight against coronavirus, India's universities have lagged far behind China's*. Mint. https://www.livemint.com/education/news/in-fight-against-coronavirus-india-s-universities-have-lagged-far-behind-china-s-11586088831865.html

Ali, S., Uppal, M. A., & Gulliver, S. R. (2018). A conceptual framework highlighting e-learning implementation barriers. *Information Technology & People, 31*(1), 156–180. https://doi.org/10.1108/ITP-10-2016-0246

Amirault, R. J. (2015). Technology transience and the challenges it poses to higher education. *Quarterly Review of Distance Education, 16*(2).

Baker, S. C., Wentz, R. K., & Woods, M. M. (2009). Using virtual worlds in education: Second Life® as an educational tool. *Teaching of Psychology, 36*(1), 59–64. https://doi.org/10.1080/00986280802529079

Barboni, L. (2019, December 12). From shifting earth to shifting paradigms: How Webex helped our university overcome an earthquake. *CISCO, Upshotstories*. https://upshotstories.com/stories/from-shifting-earth-to-shifting-paradigms-how-webex-helped-our-university-overcome-an-earthquake

Basilaia, G., & Kvavadze, D. (2020). Transition to online education in schools during a SARS-CoV-2 Coronavirus (COVID-19) pandemic in Georgia. *Pedagogical Research*, *5*(4), 1–9. https://doi.org/10.29333/pr/7937

Benson, A. D. (2002). Using online learning to meet workforce demand: A case study of stakeholder influence. *Quarterly Review of Distance Education, 3*(4), 443–452.

Boling, E. C., Hough, M., Krinsky, H., Saleem, H., & Stevens, M. (2012). Cutting the distance in distance education: perspectives on what promotes positive, online learning experiences. *The Internet and Higher Education, 15*(2), 118–126. https://doi.org/10.1016/j.iheduc.2011.11.006

Carliner, S. (2004). *An overview of online learning* (2nd ed.). Human Resource Development Press.

Chakraborty, M., & Nafukho, F. M. (2014). Strengthening student engagement: What do students want in online courses? *European Journal of Training and Development*, *38*(9), 782–802. https://doi.org/10.1108/EJTD-11-2013-0123

Chen, S. J. (2014). Instructional design strategies for intensive online courses: An objectivist-constructivist blended approach. *Journal of Interactive Online Learning, 6*(1).

http://www.ncolr.org/jiol/issues/pdf/6.1.6.pdf

Chick, R. C., Clifton, G. T., Peace, K. M., Propper, B. W., Hale, D. F., Alseidi, A. A, & Vreeland, T. J. (2020). Using technology to maintain the education of residents during the COVID-19 pandemic. *Journal of Surgical Education*, *77*(4), 729–732. https://doi.org/10.1016/j.jsurg.2020.03.018

Conrad, D. (2002). Deep in the hearts of learners: Insights into the nature of online community. *Journal of Distance Education, 17*(1), 1–19. https://www.learntechlib.org/p/96579/

Dhawan, S. (2020). Online learning: A panacea in the time of COVID-19 crisis. *Journal of Educational Technology Systems, 49*(1), 5–22. https://doi.org/10.1177/0047239520934018

Duderstadt, J. J., Atkins, D. E., Van Houweling, D. E., & Van Houweling, D. (2002). *Higher education in the digital age: Technology issues and strategies for American colleges and universities*. Greenwood Publishing Group.

Garrison, D. R., Terry Anderson, T., & Archer, W. (1999). Critical inquiry in a text-based environment: Computer conferencing in higher education. *The Internet and Higher Education, 2*(2–3), 87–105. https://doi.org/10.1016/S1096-7516(00)00016-6

Gettleman, J., & Schultz, K. (2020, March 24). Modi orders 3-week total lockdown for all 1.3 billion Indians. *The New York Times*. https://www.nytimes.com/2020/03/24/world/asia/india-coronavirus-lockdown.html

Gvaramadze, I. (2012). Developing generic competences in online virtual education programmes at the University of Deusto. *Campus-Wide Information Systems, 29*(1), 4–20. https://doi.org/10.1108/10650741211192028

Harris, R. A., & Nikitenko, G. O. (2014). Comparing online with brick and mortar course learning outcomes: An analysis of quantitative methods curriculum in public administration. *Teaching Public Administration, 32*(1),95–107. https://doi.org/10.1177/0144739414523284

Hill, J. R. (2002). Overcoming obstacles and creating connections: Community building in Web-based learning environments. *Journal of Computing in Higher Education, 14*(1), 67. https://doi.org/10.1007/BF02940951

Hofmann, D. W. (2002). Internet-based distance learning in higher education. *Tech Directions 62*(1), 28–32. https://www.learntechlib.org/p/95322/

Hooper, S., & Rieber. L. P. (1995). Teaching with technology. In A. C. Orenstein (Ed.), *Teaching: Theory into Practice* (pp. 154–170). Allyn & Bacon.

Hung, M. L., Chou, C., Chen, C. H., & Own, Z. Y. (2010). Learner readiness for online learning: Scale development and student perceptions. *Computers & Education, 55*(3), 1080–1090. https://doi.org/10.1016/j.compedu.2010.05.004

John, T., Gan, N., & Gupta, S. (2020, April 22). *90% of the world's students are in lockdown. It's going to hit poor kids much harder than rich ones*. CNN. https://edition.cnn.com/2020/04/22/world/coronavirus-vulnerable-children-intl-gbr/index.html

Johnson, R. B., & Christensen, L. (2019). *Educational research: Quantitative, qualitative, and mixed approaches* (7th ed.). Sage Publications.

Jorge, I. (2010, October). *Social presence and cognitive presence in an online training program for teachers of Portuguese: Relation and methodological issues* [Paper presentation]. The International Joint Conference and Media Days, Anadolu University, Eskisehir, Turkey. http://hdl.handle.net/10451/8674

Kebritchi, M., Lipschuetz, A., & Santiague, L. (2017). Issues and challenges for teaching successful online courses in higher education: A literature review. *Journal of Educational Technology Systems, 46*(1), 4–29. https://doi.org/10.1177/0047239516661713

Keegan, D. (2013). *Foundations of distance education* (3rd ed.). Taylor & Francis. https://doi.org/10.4324/9781315004822

King, F. B., Young, M. F., Drivere-Richmond, K., & and Schrader, P. G. (2001). Defining distance learning and distance education. *AACE Journal*, *9*(1), 1–14. https://www.learntechlib.org/primary/p/17786/

Ko, S., & Rossen, S. (2017). *Teaching online: A practical guide* (4th ed.). Taylor & Francis. https://doi.org/10.4324/9780203427354

Kulkarni, M. (2019). Digital accessibility: Challenges and opportunities. *IIMB Management Review*, *31*(1), 91-98. https://doi.org/10.1016/j.iimb.2018.05.009

Li, C. S., & Irby, B. (2008). An overview of online education: Attractiveness, benefits, challenges, concerns and recommendations. *College Student Journal, 42*(2), 449–458. https://www.learntechlib.org/p/103183/

Limperos, A. M., Buckner, M. M., Kaufmann, R., & Frisby, B. N. (2015). Online teaching and technological affordances: An experimental investigation into the impact of modality and clarity on perceived and actual learning. *Computers & Education 83*, 1–9. https://doi.org/10.1016/j.compedu.2014.12.015

Littlefield, J. (2018, January 18.). *The difference between synchronous and asynchronous distance learning*. ThoughtCo. https://www.thoughtco.com/synchronous-distance-learning-asynchronous-distance-learning-1097959

Lowenthal, P. R., Wilson, B., & Parrish, P. (2009). Context matters: A description and typology of the online learning landscape. In M. Simonson (Ed.) *Selected Papers on the Practice of Educational Communications and Technology Presented at the Annual Convention of the*

Association for Educational Communications and Technology (Vol. 2). Association for Educational Communications and Technology. https://files.eric.ed.gov/fulltext/ED511356.pdf

Luyt, I. (2013). Bridging spaces: Cross-cultural perspectives on promoting positive online learning experiences. *Journal of Educational Technology Systems, 42*(1), 3–20. https://doi.org/10.2190/ET.42.1.b

McInnerney, J. M., & Roberts, T. S. (2004). Online learning: Social interaction and the creation of a sense of community. *Journal of Educational Technology & Society, 7*(3), 73–81. https://www.jstor.org/stable/pdf/jeductechsoci.7.3.73.pdf

Merriam, S. B. (1998). *Qualitative research and case study applications in education*. Jossey-Bass Publishers.

Moore, J. L., Camille Dickson-Deane, C., & and Krista Galyen, K. (2011). e-Learning, online learning, and distance learning environments: Are they the same? *The Internet and Higher Education, 14*(2), 129–135. https://doi.org/10.1016/j.iheduc.2010.10.001

Moore, M. G. (1990). *Contemporary issues in American distance education*. Pergamon.

Nichols, M. (2003). A theory for e-learning. *Journal of Educational Technology & Society, 6*(2), 1–10. https://drive.google.com/file/d/1BbxRM8i-q-SPHGt8x7CBWo_fTKqniWyO/view

Oblinger, D., & Oblinger, J. L. (Eds.). (2005). *Educating the next generation*. EDUCAUSE. https://www.educause.edu/ir/library/PDF/pub7101.PDF

Press Information Bureau. (2020). *Government of India issues orders prescribing lockdown for containment of COVID-19 epidemic in the country*. Ministry of Home Affairs, Government of India. https://pib.gov.in/newsite/PrintRelease.aspx?relid=200655

Reich, J., Buttimer, C. J., Fang, A., Hillaire, G., Hirsch, K., Larke, L. R., Littenberg-Tobias, J., Madoff Moussapour, R., Napier, A., & Thompson, M. (2020, April 2). *Remote learning guidance from state education agencies during the Covid-19 pandemic: A first look*. EdArXiv. https://doi.org/10.35542/osf.io/437e2

Richardson, J. C., Besser, E., Koehler, A., Lim, J. E., & Strait, M. (2016). Instructors' perceptions of instructor presence in online learning environments. *The International Review of Research in Open and Distributed Learning, 17*(4), 82–104. https://doi.org/10.19173/irrodl.v17i4.2330

Robinson, C. C., & Hullinger, H. (2008). New Benchmarks in higher education: Student engagement in online learning. *Journal of Education for Business, 84*(2), 101–109. https://doi.org/10.3200/JOEB.84.2.101-109

Romei, V. (2020, April 24). Global trade contracts as Coronavirus hits world economy. *Financial Times*. https://www.ft.com/content/db3427f5-5394-4661-8e52-6447fd3d9ae9.

Saadé, R. G., He, X., & Kira, D. (2007). Exploring dimensions to online learning. *Computers in Human Behavior, 23*(4), 1721–1739. https://doi.org/10.1016/j.chb.2005.10.002

Sharma, A. K. (2020, April 15). COVID-19: Creating a paradigm shift in India's education system. *The Economic Times*. https://economictimes.indiatimes.com/blogs/et-commentary/covid-19-creating-a-paradigm-shift-in-indias-education-system/.

Stone, S. J., & Chapman, D. D. (2006). *Instructor presence in the online classroom*. ERIC. https://files.eric.ed.gov/fulltext/ED492845.pdf

Sun, A., & Chen, X. (2016). Online education and its effective practice: A research review. *Journal of Information Technology Education, 15,* 157–190. https://doi.org/10.28945/3502

Szeto, E., & Cheng, A. Y. N. (2014). Towards a framework of interactions in a blended synchronous learning environment: What effects are there on students' social presence experience? *Interactive Learning Environments, 24*(3), 487–503. https://doi.org/10.1080/10494820.2014.881391

Tao, Y. (2009). The relationship between motivation and online social presence in an online class [Doctoral dissertation, University of Western Florida]. https://stars.library.ucf.edu/cgi/viewcontent.cgi?referer=&httpsredir=1&article=4871&context=etd

Tavangarian, D., Leypold, M. E., Nölting, K., Röser, M., & Voigt, D. (2004). Is e-learning the solution for individual learning? *Electronic Journal of e-Learning*, *2*(2), 265–272. http://www.ejel.org/volume2/issue2

Triacca, L., Bolchini, D., Botturi, L., & Inversini, A. (2004, June 21–26). *Mile: Systematic usability evaluation for e-learning Web applications* [Paper presentation]. ED-MEDIA 2004, World Conference on Educational Multimedia, Hypermedia & Telecommunications. Lugano, Switzerland. Association for the Advancement of Computing in Education (AACE). https://www.learntechlib.org/primary/p/11709/

Walker, A. (2020, April 23). *Developing world economies hit hard by Coronavirus*. BBC News. https://www.bbc.com/news/business-52352395

Zapalska, A., & Brozik, D. (2006). Learning styles and online education. *The International Campus-Wide Information Systems, 23*(5), 325–335. https://doi.org/10.1108/10650740610714080

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Book Review: MOOCs and Open Education in the Global South: Challenges, Successes and Opportunities

Editors: Ke Zhang, Curtis J. Bonk, Thomas C. Reeves, and Thomas H. Reynolds (Routledge, 2020, 358 pages)

Reviewed by: Dr. Kirk Perris, *Commonwealth of Learning*

MOOCs and Open Education in the Global South: Challenges, Successes, and Opportunities takes readers around the world to gather a deeper understanding of massive open online courses (MOOCs) and open education in an international milieu. With contributions from close to 70 authors and 50 countries, readers will find numerous examples of the ways in which MOOCs differ outside the global North. Content on open education is covered in fewer pages, suggesting more familiarity amongst the authors with the MOOC course type than the open education concept.

The book is organised into seven sections and 28 chapters. Chapters cover six regions of the global South: Africa, Asia, the Caribbean, Latin America, the Middle East, and the Pacific/Oceania, along with a few chapters from the global North. One notable contribution (Chapter 2) places focus on North Korea, one of the most isolated countries on earth. In combination, this diversity demonstrates that MOOCs and open education are otherwise agnostic to political, social, or economic circumstances. A salient feature of the book is the way it summarises its contents. This is first found in the preface, with a series of bullet points and index page references for the 47 countries discussed, and again at the beginning of each section with a descriptive title and a 2–3 page summary.

Section 1 offers a historical perspective on MOOCs, with a focus on the Korean Peninsula (Chapter 2) and China (Chapter 3). A distinguishing feature of MOOCs in these areas is the governmental role in each context, and both chapters demonstrate how a nationally-planned system of offering MOOCs may yield positive learning outcomes and serve particular purposes. Chapter 2 discusses the popularity of government-sponsored MOOCs in South Korea, where the authors cite that more than 44% of the population are registered members. The authors suggest that the legitimacy gained from the Korea MOOC system in the South may serve as a diplomatic tool to enhance relations with the North. China has created a large government-supported MOOC ecosystem (Zhang et al., 2019). In Chapter 3, the authors provide a brief overview of MOOCs in China from 2012 and describe MOOC providers, user profiles, and a summary of the research. This analysis will be useful to readers from less mature MOOC ecosystems. Amidst the volume of research discussed, the authors note that more empirical work on pedagogy, attrition, and learner behaviours is needed.

Section 2 explores the design and practices of MOOCs and centres on contextualisation, with input from Canada, Egypt, Fiji, Latin America, Nepal, and the United States. The eight chapters in this section discuss

the impact of contextual issues on language and learning approaches, resources, and geography. In Chapter 4, which focuses on Egypt, the authors assert that MOOCs are routinely translated from English to another language, yet this is often done without the necessary cultural cues that would enable more "equitable experiences and outcomes" (p. 52). Another issue has been that MOOCs typically rely on a "banking model approach" (p. 49) or a "content-centric focus" (p. 72). Authors in this and other sections advocate for a more learner-centred rather than a didactic approach to MOOC design. A prevailing challenge discussed across the chapters in this section is lack of capacity, which is linked to financial and human resource limitations, another common theme found elsewhere in the book. In addition to pedagogical inputs, Section 2 provides important information on adapting, contextualising, and creating MOOCs. The Climate Change and Pacific Islands MOOC discussed in Chapter 8 is an example of an innovative MOOC that responds to a region beset by the recurrence of natural disasters.

In Section 3, the focus is on the use of open education and MOOCs for professional development, with case studies from Canada, South Africa, Thailand, and Turkey. Adult learners are central to this section, and readers will discover interesting findings on the market appeal and sustainability of MOOCs. An important theme discussed in this section is the centrality of instructors' active engagement and collaboration with learners to the success of MOOCs, reminding us that online learning may not be best characterised as independent learning. Furthermore, success in a MOOC is not necessarily defined as completion; in some cases, participation is, as the authors note in Chapter 14 (Canada).

Section 4 comprises three chapters and discusses the international appeal of MOOCs. Attention is devoted to participant perceptions. In a notable contribution, Chapter 16 reports on the experiences of an international collection of individuals (as learners or instructors) who participated in MOOCs offered by Cornell University in the United States. Beyond learning content, the participants found that MOOCs provided platforms for building community and on-the-ground activities, highlighting tangible social outcomes from the learning experience, reinforcing the point made on participation in the preceding paragraph. Two chapters provide valuable insights on learner perceptions of MOOCs, which are drawn from a collection of emerging world contexts: Chapter 16 on MOOCs used in countries of the Asia-Pacific Economic Cooperation forum, and Chapter 17 on MOOCs used in the Inter-American Development Bank. Both chapters call for a more coordinated effort on the part of governments to strategise nationally and to collaborate regionally to advance the implementation of MOOCs.

Section 5 presents aspects of governmental policies and strategies for open education and MOOCs in four chapters with contributions from Brazil, Malaysia, the Middle East, and the Philippines. Chapter 19 shares findings from a large survey study on the views of institutions on open education across Brazil. A total of 2,660 valid surveys were received from more than 100 public universities with links to the Open University of Brazil (UAB). Survey questions centred on policy and implementation of open education. Findings reveal considerable interest among respondents in advancing open education but little action. The authors highlight that legislation on distance education was not enacted until 1996; and, with the establishment of UAB 10 years later, there is likely much room for growth in open education in Brazil. In Chapter 20, the author reflects on the Malaysian government's stipulation that by 2015 all public universities offer 15% of courses as MOOCs and 30% by 2020, with an emphasis on pedagogical training for online learning and a view to sustainability. The author concludes that much work remains.

Another governmental open education initiative emanates from the Philippines (Chapter 21). The Philippine Commission for Higher Education has been supporting the OERs for Development Framework (OERs4D), and the authors describe a sequence of events that has led to wider implementation of MOOCs across the archipelago. MOOCs, as a product of the OERs4D, embrace the universal design for learning framework and other accessibility considerations (e.g., mobile-enabled platforms) to enhance uptake. In the final chapter of this section (Chapter 22), the authors discuss government-sanctioned MOOC interventions in several states in the Middle East, including Egypt, Jordan, Lebanon, Saudi Arabia, and others. The authors view MOOCs as filling an unmet demand for learning, citing examples of the large populations in the region and the appeal of MOOCs to refugees, individuals in conflict zones, and female learners. The authors lament, however, that there is a dearth of MOOCs in Arabic. A search conducted online revealed that the two dominant Arabic MOOC sites, Rwaq and Edraak, list approximately 650 MOOCs for adult and higher education. The contextualisation of MOOCs, however, should focus on more than language. There are cultural (i.e., gender) and geopolitical (i.e., conflict) factors that can serve to make MOOCs a unique learning experience.

Section 6 focuses on the innovations and scalability of MOOCs. Chapter 23 focuses on the learning opportunities of the World Bank's Open Learning Campus (e.g., courses, repositories, and reports, among others), which have reached more than 4 million individuals. Much of the materials focus on sustainable development goals. While enrolment benefits from the vast network of the World Bank, the singular focus on a topical area (e.g., climate change, machine learning) demonstrates the potential for scale. Chapter 24, focuses on fostering a culture of open education practices (OEPs) through capacity building in adopting open educational resources (OERs). The chapter centres on a study of 26 individuals from six countries located in Sub-Saharan Africa. While some progress was made in the uptake of OEPs, the authors believe that for OEPs to be more fully realised, a wholesale institutional approach is needed.

Chapter 25 focusses on the scalability of MOOCs through an innovative, low-bandwidth solution. A team from the Commonwealth of Learning and the Indian Institute of Technology, Kanpur, designed a learning management system called mooKIT. From 2015–2018, MOOCs offered on mooKIT attracted learners from 94 countries and an aggregate enrolment of more than 44,000 learners. Close to 25% of the learners that enrolled received a certificate of completion, at a per certificate cost of US$11. This case demonstrates that a low-bandwidth solution may enable the enrolment of many more learners than would otherwise be possible. Chapter 26 presents another low-cost solution to access education through MOOCs for a collection of Kenyan learners with limited technological skills. The study revealed that learner supports implemented during the onboarding phase to learning online may have been integral to increasing completion rates in the MOOC.

The seventh and final section of the book looks to the future of MOOCs and open education. In Chapter 27, the authors predict that artificial intelligence (AI) will be increasingly mainstreamed in education, opening doors for intelligent MOOCs that will enable greater focus on personalised education. The 28th and concluding chapter is authored by the four editors, who offer 10 predictions on MOOCs and open education. To mention a few, the authors predict that in 15 to 20 years,

- MOOCs will primarily target working adults who are focused on up/re-skilling.

- AI will update MOOCs and OERs, with the role of humans limited to quality assurance.
- MOOC design will become more learner-centred and enabled through authentic and interactive learning experiences.

The editors conclude with an outlook that is both ominous and optimistic. The world of work is changing, perhaps more rapidly than the average person realises, with the onset of AI and automation. Whether in Silicon Valley or rural Sudan, technology is changing society and making employment increasingly specialised. To address this change, the editors advocate for a greater uptake of "a massively open distributed education ecology of MOOCs and OER" (p. 347).

Throughout the book, there is a wealth of information for individuals seeking a deeper understanding of how MOOCs and open education are being adopted around the world. The global South, upon which the book is focused, presents issues that are largely known in the field of open education and MOOCs: uneven Internet connectivity, lack of financial resources, need for capacity building, and reliance on outdated design and pedagogical approaches. These issues notwithstanding, there are some important findings in the different chapters relative to innovations, scalability, and cross-country partnerships. Some examples are language considerations, courses that have only regional appeal, use of low-bandwidth solutions, and development of transnational partnerships.

The most likely outcome of the editors' predictions is that MOOCs will continue to appeal to working adults given the ongoing need to acquire or refine their skills. Connectivity issues around the world will persist; and MOOCs are not overly helpful in addressing this challenge given their great reliance on videos, which require large amounts of bandwidth and data. Indeed, the mooKIT learning management system (Chapter 25) presents a low-bandwidth alternative; but mainstreaming other aspects of open education should garner greater attention. Increased uptake of OER needs sectoral if not ministerial leadership. OER has proven to be cost effective in reducing textbook costs (Caldwell, 2020; Wiley et al., 2012), particularly as open textbooks. Yet, political will, comprehensive capacity building, and financial resources are key to moving such initiatives forward. Any interventions must also be located in identifying and understanding a given problem to which open education and MOOC interventions are the solution. One-off projects, in the absence of sound strategic considerations, offer little to address the problem of access to quality learning. Instead, any intervention must be couched in a view to sustainability and, ultimately, impact for learners.

References

Caldwell, J. (2020, March 23). Ongoing adoption: Estimating, calculating, and tracking. BCCampus. Retrieved from https://bccampus.ca/2020/03/23/ongoing-adoption-estimating-calculating-and-tracking/

Wiley, D., Hilton III, J. L., Ellington, S., & Hall, T. (2012). A preliminary examination of the cost savings and learning impacts of using open textbooks in middle and high school science classes. *The International Review of Research in Open and Distributed Learning, 13*(3), 262–276. https://doi.org/10.19173/irrodl.v13i3.1153

Zhang, J., Sziegat, H., Perris, K., & Zhou, C. (2019). More than access: MOOCs and changes in Chinese higher education. *Learning, Media, and Technology*, *44*(2), 108–123. https://doi.org/10.1080/17439884.2019.1602541

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Preparing Educators to Teach in a Digital Age

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Abstract

This article describes the practical implementation of parts of *Teaching in a Digital Age: Guidelines for Designing Teaching and Learning* by A.W. Bates (2015) in a course for educators in Austria and the development of medical education for universities in Iran. With the publication of the second edition of *Teaching in a Digital Age* in 2019, the authors show the impact of the book in training educators and developers of educational content. This note from the field emphasizes the benefits of making informed decisions about educational technologies using Bates' (2015) SECTIONS model and of learning about massive open online courses (MOOCs) and how to work with them using his book.

Keywords: educational technology, massive open online courses, MOOCs, open educational resources, OER, media-supported learning, digital teaching skills

Introduction

Today, one of the main features of learners in the digital age is to have the skills needed to teach and learn in the new digital environments. Teachers need to be fluent in new technology methods so that they can use new teaching methods in the digital world and make the learning and classroom environment more effective. In line with the mentioned goals, this article is to provide new educational experiences to apply the concepts of new educational technologies in two international environments. To achieve this goal and use a guiding principle, the book *Teaching in the Digital Age: Guidelines for Designing Teaching and Learning*, a well-known book in the international community in the field of educational technology, was selected by the authors. The main purpose of this article is to present and reflect on the applications of the book *Teaching in a Digital Age* in two educational settings in Iran and Austria and the main focus is on the application of the SECTIONS model and the concept of MOOCs.

Teaching in a Digital Age

Teaching in a Digital Age: Guidelines for Designing Teaching and Learning (Bates, 2015) introduces the principles of effective teaching in a digital age and provides instructors with a framework for teaching and learning using technology. The book also offers guidelines for best practices when redesigning teaching to incorporate the use of technology. It offers teachers and instructors the knowledge and skills they need in a digital age. The second edition of *Teaching in a Digital Age* was published in October 2019 (Bates, 2019a). The first edition of the book has been translated into Chinese, French, Japanese, Portuguese, Spanish, Turkish, and Vietnamese. Parts of the book have also been translated into Farsi. Both editions of the book are available online as an open-access resource (with links to translations of the first edition) through a Canadian organization (BCcampus), under a Creative Commons Attribution-NonCommercial 4.0 International License.

In Chapter 1 of the first edition, Bates (2015) discusses the factors that affect teaching and learning in the world today, including changes in the global economy, the growth of a knowledge society, and the changing nature of jobs. He identifies the skills educators need in the digital age and asserts that faculty must adapt their teaching to the learning styles of the very diverse, new generation of students. Chapter 2 presents epistemological theories on learning, including behaviorism, cognitivism, constructivism, and connectivism. Chapter 3 focuses on the settings and environments of campus-based learning, and Chapter 4 discusses online teaching methods and the limitations of classroom design models for online learning.

Chapter 5 focuses on the concept of massive open online courses (MOOCs). In this chapter, Bates explains the concept of MOOCs, their features and components. The author distinguishes between two types of MOOCs, xMOOC and cMOOC. xMOOC refers to an extended Massive Open Online Course, which has specific and organized assignments, formal evaluation, and a certificate. Future Learn, Canvas, Udacity, Coursera, and edX are among the most well-known xMOOCs in the world (Aldahmani, Al-shami, Adil, & Sidek, 2020). The “c” in cMOOC refers to connectivist, which represents the nature of cMOOC and involves groups of people learning together rather than learning being facilitated primarily by the instructor. Learners choose what content or skills they want to learn and is personal so there are no formal training plans. In cMOOCs, there is a lot of emphasis on networks, especially the active participation of participants with content (Bates,2019).

Generally, xMOOC use platforms that are similar to Learning Content Management Systems (LCMS), while cMOOCs, which are based on social learning, use social media platforms and networks (Anderson, 2008). Overall, the main difference between the cMOOC and xMOOC is the educational philosophy that guides them.

He compares the two and describes their strengths and weaknesses. Finally, he describes the political, cultural, and economic impact of MOOCs on university activities. Chapters 6–13 are devoted to the concept of educational technologies and media. Educational media and their characteristics are described, including text, audio, video, and computing, as well as social media, gamification, virtual reality, augmented reality, and artificial intelligence. Bates emphasizes that building a comprehensive and effective learning environment is an important condition for implementing teaching and learning in the digital age.

In Chapter 8, Bates presents the SECTIONS model, a framework for making effective decisions about the choice and use of technology and media in teaching and learning. The SECTIONS model provides a set of criteria that can help an instructor/teacher make decisions about which media or technologies to use.

The SECTIONS model is based on:

- **S**tudents
- **E**ase of use
- **C**ost
- **T**eaching functions, including pedagogical affordances of media
- **I**nteraction
- **O**rganizational issues
- **N**etworking
- **S**ecurity and privacy

In the new model of *SECTIONS* “S” from “Speed” has changed to "Security and privacy.”

Chapters 9 and 10 present a continuum of technology-based learning, from face-to-face to fully online programs. According to Bates, teachers must decide where a particular course or program should be located on the continuum. Chapter 11 describes open educational resources (OER), their principles, sources, and uses and discusses the advantages and limitations of open textbooks, open research, and open data. Chapter 12 defines the quality of teaching in the digital age and proposes a nine-step plan for teaching effectively in an online environment. The final chapter is devoted to the importance of developing and training teachers and instructors for technology-based teaching and learning. The chapter provides a model for promoting knowledge among educators, explains the concept of team teaching, and introduces an institutional strategy for teaching in the digital age.

The second edition of *Teaching in a Digital Age* (Bates, 2019a) includes the latest emerging educational technologies. In this edition, the first chapters continue to focus on theory and outline the principles and guidelines for teaching and learning in the digital age. From Chapter 6 onward, the book moves from theory into practice and identifies essential processes for teaching in the digital age. Both editions of the book are intended for teachers and educators, but the book can also help students develop the knowledge and skills required for learning in the digital age. Furthermore, the book is relevant for instructional designers, curriculum planners, instructors, K-12 teachers, teacher candidates, and educational administrators engaged in redesigning classrooms. *Teaching in a Digital Age* provides solid guidance for decision making regarding whether courses should be face-to-face, blended, or fully online (Bates, 2015, 2019a).

Both editions of the book offer clear images, diagrams, videos, and photos, as well as links to podcasts. Each section in the chapters begins with a scenario to help readers draw a concept map of the subject matter. Suggested activities add to the discussion, and references and suggestions for further reading appear at the end of each section. "Key Takeaways" at the end of each chapter summarize its practical implications for teaching and instructional design (Bates, 2015, 2019a).

The first edition of *Teaching in a Digital Age* was greeted with great interest by educators who mostly played the role of educational designer, and several reviews have been published. Serpil Kocdar (2017) from Anadolu University, for example, emphasizes the interactive nature of the book: "It combines theoretical and conceptual knowledge with practical information by presenting scenarios from real-life experiences, reflective questions in the activities, podcasts, videos, and the author's observations. I felt a continuous interaction with the author while reading the book." The book was added to the Multimedia Educational Resource for Learning and Online Teaching (MERLOT) resources in 2016, and a peer review was published on the MERLOT website in 2018 (Teacher Education, 2018). Other reviews of the book have focused on its usefulness for teaching and continuing education for individuals involved in adapting teaching and learning for technology-rich scenarios (Duzenli, 2018; Mulyono, 2017). The translation of the first edition of *Teaching in a Digital Age* into several languages further demonstrates the respect and attention this book has received.

Using the SECTIONS Model in an e-Education Program at Danube University Krems

Danube University Krems, Austria, is an institute for continuing education. Until 2019, it mainly offered master's-level programs, with a focus on students who have work experience. The programs are, for the most part, designed so that students can pursue their studies while continuing to work. Thus, most courses are offered through blended learning. An e-education program has been offered at Danube University since 2007. It is a master's-level program and consists of 90 European Credit Transfer and Accumulation System (ECTS). The program is modular in design, and most modules grant 3 ECTS. The core modules in the first two terms are Educational Technology (Bildungstechnologie) and Didactic Design. Each of these modules grants 6 ECTS (Himpsl, 2010). The working language is German. All modules are delivered through blended learning, with short face-to-face periods.

In the educational technology module, students become acquainted with learning theories (based on Baumgartner, 2004) and are asked to provide practical examples of how these theories correspond with (media-supported) learning scenarios. Students' reflections on the use of e-learning environments (i.e.,

Moodle, as a learning management system; Mahara, as an ePortfolio space; and Media Wiki, as a free and open-source) helps them develop the ability to use learning theories in the analysis and use of educational technology. Bate's (2015) SECTIONS model has proven very helpful in this context, as it provides students with a framework for considering "the choice and use of media for teaching and learning." Bates' model was first used in the e-education program in 2018, in a course called eEducation12. Before the introduction of the model, students studied learning theories and wrote a short paper on a media-supported learning scenario. Pages were set-up on the course's Media Wiki, with the topics of the students' papers, for their work with the model. The model's criteria for media selection (Bates, 2015) were presented to students in German (Figure 1).

Figure 1

The SECTIONS Model in e-Education Program (in German), based on A.W. Bates (2015)

Note. Adapted from *eEdu13_bildungstech1ePortfolio*, by A. Ghoneim, 2019, Danube University Krems.

Bates' (2015) SECTIONS model for choosing and using media (and/or technology) in education is built around nine criteria. In Chapter 8 of *Teaching in a Digital Age*, Bates (2015) presents basic information on each criterion and questions for consideration:

- **S**tudents: As students are the main target group for media use in education, one must consider student demographics, student access to the chosen media/technology, and differences in how students learn. Questions for consideration include, "If your students are to be taught at least partly off-campus, to which technologies are they likely to have convenient and regular access at home or work?" (Chapter 8.24).

- **E**ase of use: The ability of students to use the technology as intuitively as possible must be considered. This criterion also includes issues of support needs and considers questions, such as "How easy is it to maintain the technology?" (Chapter 8.3).

- **C**ost: Institutional costs for technology development, delivery, maintenance, and overheads (e.g., licensing), which cannot be allocated to a single course, should also be considered. Bates provides a table of cost factors from an instructor's perspective (Chapter 8.4).

- **T**eaching and media selection: Using Mayer's 12 principles of multimedia design (Mayer 2009), Mayer discusses 12 principles that shape the design and organization of multimedia presentations. These principles are coherence principle, signaling principle, redundancy principle, spatial contiguity principle, temporal contiguity principle, segmenting principle, pre-training principle, modality principle, multimedia principle, personalization principle, voice principle, and image principle. Bates identifies important pedagogical questions for consideration, for example, who are my students? or What content needs to be covered? (Chapter 8.5.4).

- **I**nteraction: Bates divides media interaction characteristics into inherent, designed, and learner-generated interactivity. These interactions must be considered as well as the interaction of materials, teachers, and learners (and between the learners). Besides, the effective use of teachers' time should be taken into account: "What kinds of interaction will produce a good balance between student comprehension and student skills development, and the amount of time I will be interacting personally or online with students?" (Chapter 8.6).

- **O**rganizational issues: Technologies that are implemented in an institution, as well as existing support for their use, should be considered. When technologies and support are available, teachers can work with professional media designers and consult with them to set appropriate goals for media and technology use (Chapter 8.7).

- **N**etworking: The influence of social media in the application of networking in course design should be considered as well as the potential use of social media as a supplement to standard learning technologies. Student-generated learning materials, cMOOCs, and instructor-led OERs should also be considered in this context. Bates recommends considering the following questions, "How important is it to enable learners to network beyond a course, with others such as subject specialists, professionals in the field, and relevant people in the community? Can the course, or student learning, benefit from such external connections?" (Chapter 8.8).

- **S**ecurity and privacy: While in recent years many social media services have moved to online clouds and teaching and learning has become more open and public, Bates emphasizes the importance of considering concerns regarding students' privacy (Chapter 8.9).

Following the introduction of the model criteria, students worked in pairs to complete an assignment, using the model:

1. Interview your peer: Ask them about the tool/medium they presented in their paper. Consider how you would evaluate their tool using the SECTIONS model.

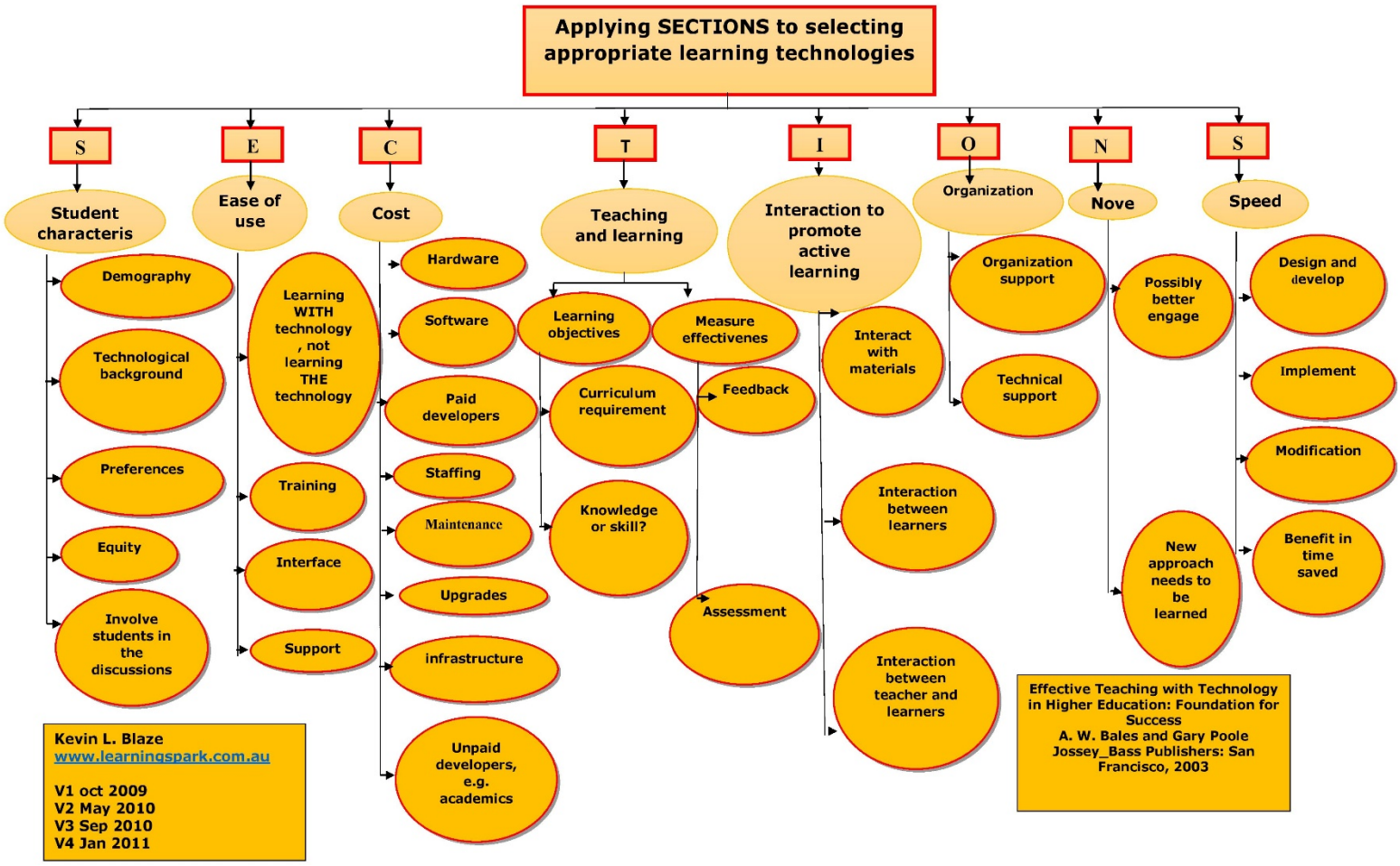
2. Write an entry about the tool in the course Wiki and discuss the learning theories that correspond with the use of the tool.

The instructor suggested that students with similar paper topics form pairs. Each pair was responsible for editing two Wiki pages (about two media). In a follow-up assignment, students were asked to enhance the interlinks of their Wiki pages by adding other pages from the course Wiki. The students found the SECTIONS model criteria very useful not only in completing the assignment but also in their professional work. Furthermore, some of the students' e-portfolios for the course showed that they had read more of Bates' (2015) book to complete their assignments on the use of educational technology.

The following year, work with the SECTIONS model was repeated in the module on educational technology. In the second iteration, Media Wiki was replaced with Moodle Wiki because students wanted to work with the tools (such as editing a document together) that Moodle offers, though the assignment remained the same. Bates' book was included in the recommended literature for the module, and some students had read parts of *Teaching in a Digital Age* before the presentation on the SECTIONS model and the assignment. One of the students found a diagram of an older version of the SECTIONS model (Bates & Poole, 2003; Figure 2) and posted it in the class Wiki. The other students did not comment on the diagram, nor did they seem to notice that two of the criteria differed from the model used in the course. According to Bates and Poole (2003), N stands for "novelty" and S stands for "speed"; whereas, according to Bates (2015), N stands for "networking" and S stands for "security and privacy."

Figure 2

Bates and Poole's (2003) SECTIONS Model



Note. Adapted from *Applying SECTIONS to selecting appropriate learning technology* [Diagram], by Kevin L. Blazé, 2011, Ringwood North, Australia (http://learningspark.com.au/2017/teaching-with-technology).

Using *Teaching in a Digital Age* at Torbat Heydariyeh University of Medical Sciences

Torbat Heydariyeh University of Medical Sciences is a public university located in Khorasan Razavi province in northeastern Iran. More than 1000 students are enrolled at the university, and currently, the institution grants more than 15 different degrees at the undergraduate, graduate, and doctoral levels. The university comprises three schools that offer diverse academic programs in the medical sciences: the School of Health, the School of Paramedic Sciences, and the School of Nursing and Midwifery. The university administrators are working on establishing a medical school as well. It should be noted that according to the spatial planning document from the Ministry of Health, Medical Sciences universities in Iran are divided into 10 macro-regions. Torbat Heydariyeh University of Medical Sciences, along with other universities in the east of the country, is located in the macro-region 9 (Secretariat of the headquarters for

transformation in the education. n. d). The Virtual Education Center, one of the best teaching facilities at the university, was established in 2018 and occupies 550 square-meters. The center's faculty members and staff specialize in virtual education planning, health information technology, and educational management. The center has an acoustic room, an audio/video recording studio, an online testing center, and a webinar room, a server farm room, an educational technology lab, as well as the university's Department of New Educational Technology (Figure 3). The history of e-learning activities at this university goes back to 2014 when the learning management system (LMS) was launched to implement blended courses (Virtual Education Center, 2018).

Figure 3

The Voice and Image Recording Studio

Note. Left panel: Ali Gorji, Visiting Professor and Director of the Epilepsy Research Center, Münster University, Germany; Right panel: The interior of the Voice and Image Recording Studio.

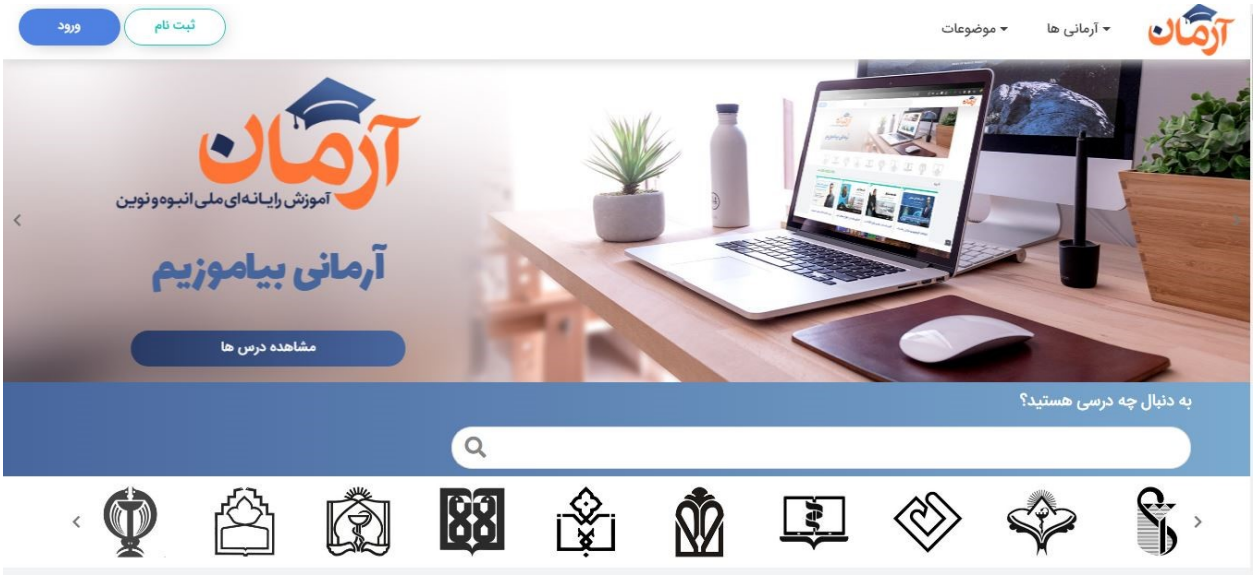
In 2018, Torbat Heydariyeh University of Medical Sciences signed a contract with Iran's Virtual University of Medical Sciences to produce 34 items of electronic content for the national MOOCs (Virtual University of Medical Sciences, 2018). The Virtual University of Medical Sciences was established in 2017, under the direct supervision of the Deputy of Education of the Ministry of Health in Iran, to develop and strengthen virtual education at medical sciences universities. Its main goals are to lead and establish virtual education standards among virtual education centers and colleges and develop programs for virtual medical education in the medical sciences universities. To accomplish these goals, educational policymakers at the Virtual University of Medical Sciences undertook the establishment of a national MOOC platform, ARMAN MOOCs (Figure 4). ARMAN is a Farsi abbreviation for New and Massive National Computerized Education. ARMAN MOOCs are the only national MOOCs in Iran in the field of medical sciences. One of the main tasks of the Virtual University of Medical Sciences was to produce e-content for the national MOOCs, with the help of medical sciences universities across Iran. For this purpose, the Virtual University of Medical Sciences developed a set of principles and technical standards for e-content and issued two calls for its production in 2018 and 2019.

The ARMAN MOOCs are in Farsi, but its platform managers aim to develop the MOOC nationally and internationally. Hundreds of electronic materials are now available in the area of medical sciences and the

numbers are increasing. Currently, many medical sciences universities throughout Iran are cooperating with this MOOC.

Figure 4

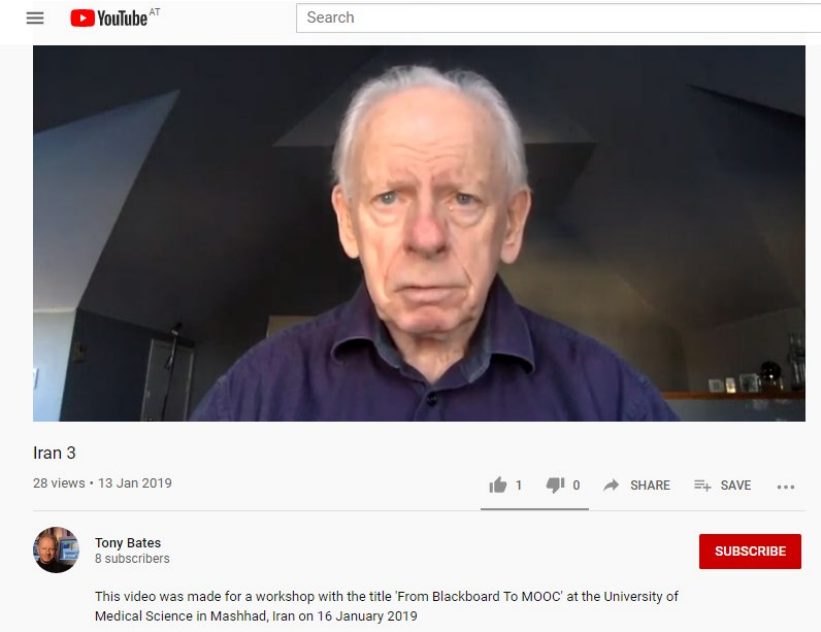
Home Page of the ARMAN MOOC Website



Before setting up the Virtual Education Center in 2018, faculty members of Torbat Heydariyeh University of Medical Sciences mainly used traditional teaching methods and were not familiar with virtual teaching. To implement educational technology at the university, the Virtual Education Center had first developed the technological infrastructure needed to produce electronic content. The Center then designed several workshops to familiarize faculty members with the concepts of modern educational technology. The first and third workshops were held at the beginning of 2019 and were each 6 hours in length. The second workshop was about one hour in length and due to the short time, participants were introduced to the concept of MOOCs in summary after the second workshop individually, in-person and virtually. The first workshop, From Blackboard to MOOC, was held on January 16, 2019, at Mashhad University of Medical Sciences, by invitation of the Director of Medical-Education Development (Keshavarz,2019, January 16). Faculty members from Torbat Heydariyeh University, Mashhad University, and other medical sciences universities in macro-region 9 (e.g., Bojnurd University, Birjand University, Sabzevar University, and Neyshabur University) participated in the workshop. A. W. Bates (2019b) prepared a short video to welcome participants to the workshop and to introduce his book *Teaching in a Digital Age*. The video was uploaded to YouTube on January 13, 2019 (Figure 5). In this clip, Dr. Tony Bates summarizes the importance of "*Teaching in the Digital Age*" and explains that this book provides guidance and practical instructions for educational designers and teachers in the digital age, and this book has been translated into various languages around the world. In the end, he thanked Dr. Keshavarz, lecturer of the workshop, and his team for paying attention to this book and translating the book into Persian.

Figure 5

Bates' Introduction to From Blackboard to MOOC Workshop



Note. From *Introduction to From Blackboard to MOOC* [Video], by T. Bates, 2019, YouTube (https://www.youtube.com/watch?v=llTfFy6nKSQ).

Before the workshop, participants completed a multiple-choice questionnaire to assess their knowledge about MOOCs. Results of the questionnaire revealed that the faculty members had very little knowledge in this area. The workshop began with a presentation of the video that Bates (2019b) prepared to establish the international character of the workshop. The workshop instructor then introduced the concept, history, and types of MOOCs based on Chapter 5 of *Teaching in a Digital Age* (2015) as well as examples and models from the book (Figure 6). For many faculty members, this was their first encounter with MOOCs. The Farsi translation of *Teaching in a Digital Age* (Bates, 2015, 2016), was also introduced. Participating faculty members reported that they were very satisfied with the workshop.

Figure 6

From Blackboard to MOOC Workshop Presentation

Note. Adapted from *From Blackboard to MOOC* [Workshop presentation], by M. Keshavarz, (2019, January 16), Mashhad University of Medical Sciences, Iran.

The second workshop, "Introduction to MOOCs," was held at Mashhad University of Medical Science on February 13, 2019. In the fourth part of this workshop, which also covered the concept of MOOCs, using the book *Teaching in a Digital Age* focused on introducing the MOOCs concept.

It should be noted that in addition to the faculty members of Mashhad University of Medical Sciences, several faculty members of medical sciences universities of the 9th macro-region also participated in this workshop (Figure 7).

Figure 7

Introduction on MOOCs Workshop Presentation

Note. Adapted from *Introduction on MOOCs*: The fourth part [Workshop presentation], by M. Keshavarz, (2019, February 13), Mashhad University of Medical Sciences, Iran.

Also, one of the main goals in holding this type of workshop outside Torbat Heydariyeh University of Medical Sciences was the possibility of participation from all faculty members of medical sciences universities in macro-region and inter-university cooperation in the education transformation headquarters.

Following the two workshops, faculty members who visited the Virtual Education Center to learn more were offered personal consultations. In these consultations, Center staff explained digital teaching methods and the importance of MOOCs as a teaching tool. The consultations raised interest among faculty members in using virtual teaching methods. After the workshops and consultations, faculty members continued to visit the Virtual Education Center, and they have gradually become interested in producing electronic content and using blended teaching methods in their courses.

Another workshop, Introduction on MOOCs, was held on September 25, 2019, at Bojnurd University of Medical Sciences in North Khorasan Province for faculty members and university administrators. Faculty members of Torbat Heydariyeh of Medical Sciences were also invited to this workshop, with the content for this workshop primarily being drawn from *Teaching in Digital Age* (Figures 8–9). In addition to providing an introduction to MOOCs, the workshop instructor advised administrators on the development of virtual education infrastructure. As a result of the workshop, Bojnurd University of Medical Sciences administrators are in the process of setting up a professional studio for audio and video recording and

intend to produce electronic content for the ARMAN MOOC. It should be noted that this workshop was held to provide advice to faculty members from Bojnurd University of Medical Sciences.

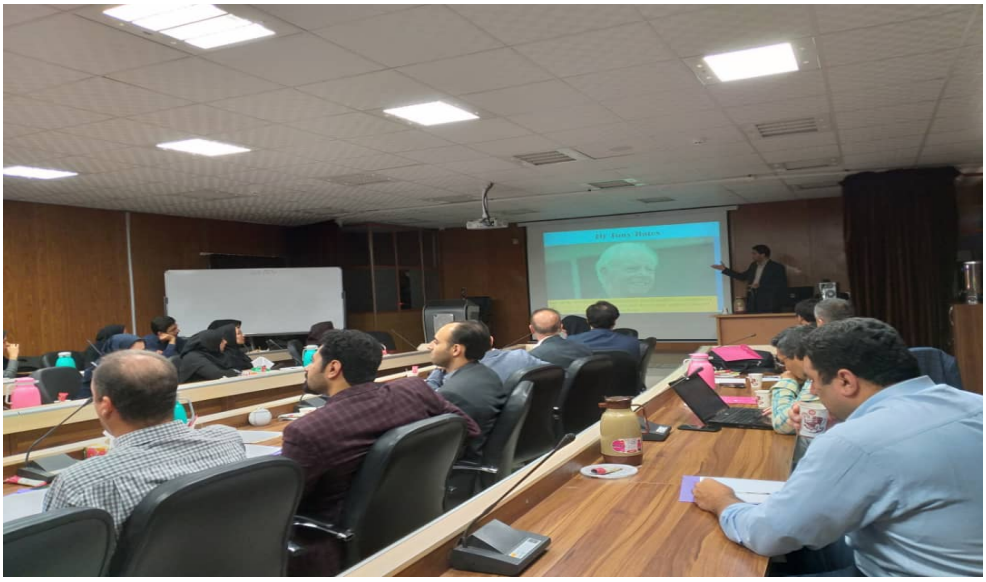
Figure 8

Introduction on MOOCs Workshop Presentation

Note. Adapted from *Introduction on MOOCs* [Workshop presentation].by M. Keshavarz (2019, September 25), Bojnurd University of Medical Sciences, Iran.

Figure 9

Introduction on MOOCs Workshop



Note. From *Introduction on MOOCs* [Workshop presentation], by M. Keshavarz (2019, September 25), Bojnurd University of Medical Sciences, Iran.

In October 2019, the Virtual Education Center at Torbat Heydariyeh University of Medical Sciences and faculty from diverse health fields at the university produced 34 items of electronic content for the national ARMAN MOOCs (Virtual University of Medical Sciences, 2018). According to figures 11–12, these e-contents are now available to all medical students and students interested in health issues on the ARMAN MOOC Website (2019a). The Virtual Education Center at Torbat Heydariyeh University of Medical Sciences is producing electronic content for the national ARMAN MOOCs and aimed to double the production of electronic content by the end of 2021. As a result, holding workshops on MOOCs had also affected other universities in region 9, with these universities now planning to produce electronic content for ARMAN MOOCs and upgrading e-learning infrastructure. This is a significant expansion of content production for the national ARMAN MOOCs compared to other universities in the field of medical sciences in Iran. It is the objective of the university's second collaboration with the Virtual University of Medical Sciences to produce another 50 electronic materials (2019b).

Teaching in a Digital Age, through workshops and personal consultations have increased the participation of faculty members at the university in the production of electronic content and the use of blended teaching methods in their courses. Faculty members are creating electronic content at an increasing rate. Currently, each of the 76 faculty members at the university collaborates in the production of electronic content and has created items of electronic content in the field of medical sciences. Today, the professors at this university largely present their courses through blended learning and national learning management systems, called NAVID, and the students appear to welcome the flexibility these methods afford. The Virtual University of Medical Sciences is responsible to create and develop a national learning management

system, NAVID is an abbreviation in Persian means "*Special Software for University Learning*" (Figure 10). Currently, NAVID and ARMAN are two new educational technologies among the medical sciences universities in Iran, which are used to promote teaching and learning in the online environments and especially in the current context of COVID and university closures. In the end, it must be said that now, Torbat Heydariyeh University of Medical Sciences, with extensive activity in the field of e-learning and in line with the development of virtual education, has become an e-learning and virtual education hub among medical sciences universities in Eastern Iran.

Figure 10

Home Page of the NAVID Website: National Learning Management System

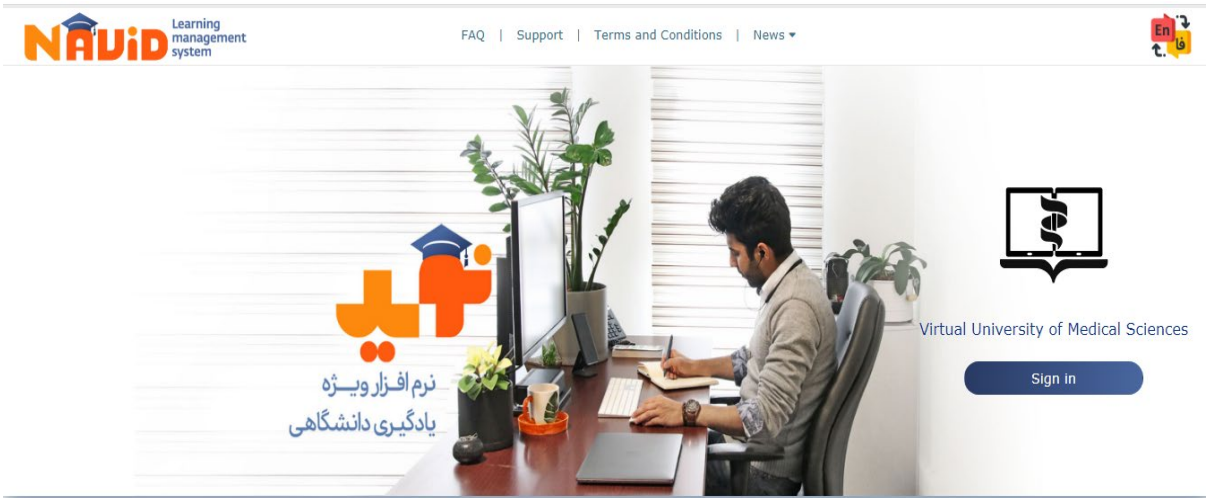


Figure 11

Sample of Electronic Contents on ARMAN MOOC Website by Torbat Heydariyeh University of Medical Sciences

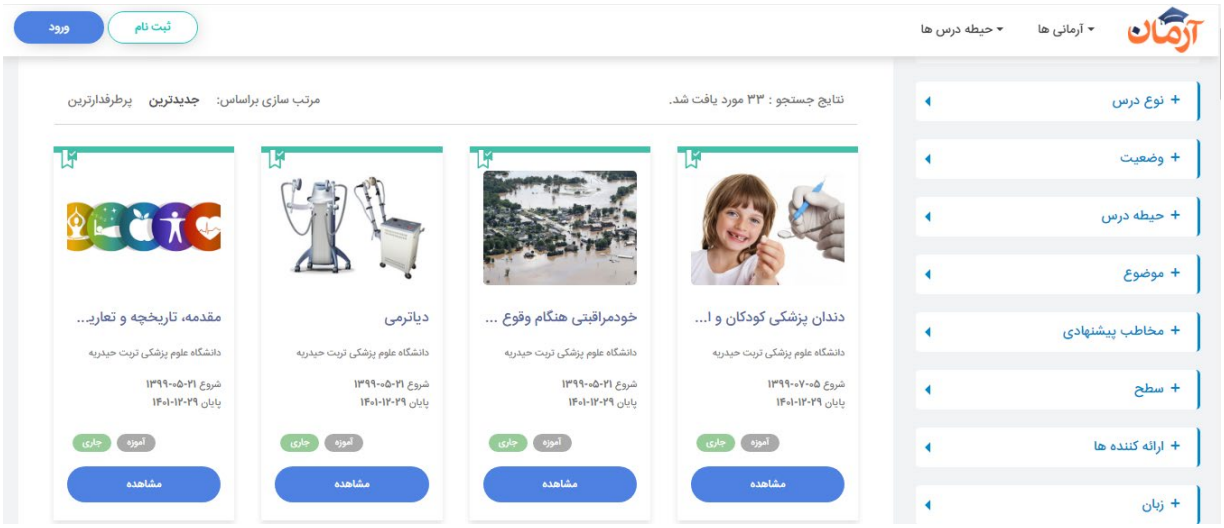
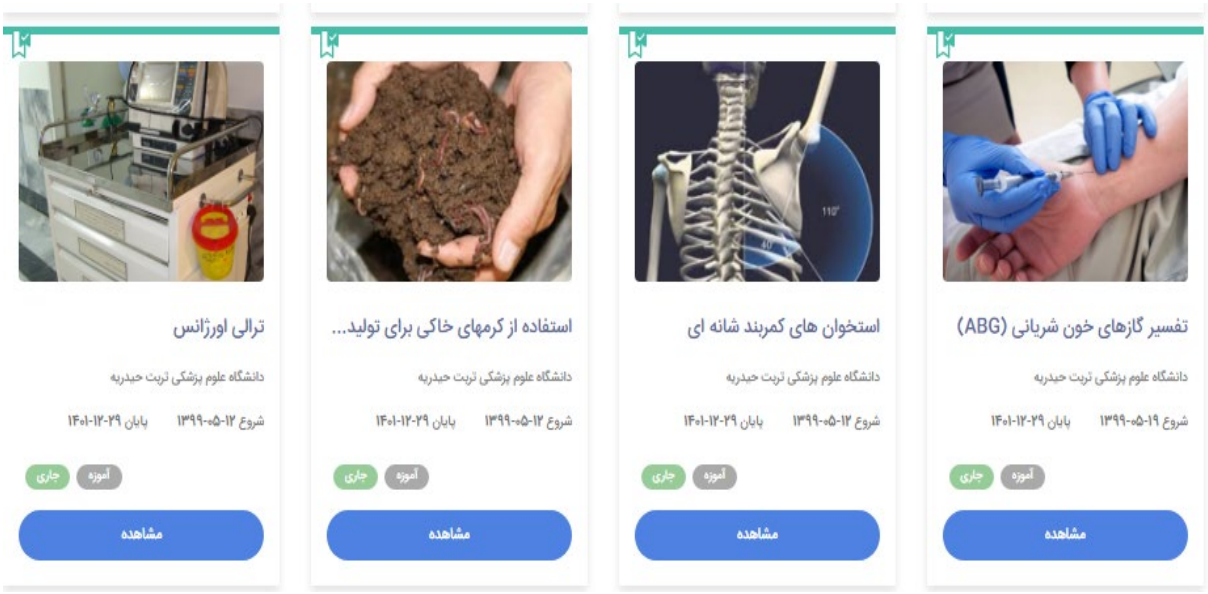


Figure 12

Sample of Electronic Contents on ARMAN MOOC Website by Torbat Heydariyeh University of Medical Sciences



Torbat Heydariyeh University has expanded the use of virtual education among its faculty members by familiarizing them with MOOCs and e-learning methods, using *Teaching in a Digital Age* (Bates, 2015) in workshops and personal consultations. The use of Bates' seminal book at the university and in macro-region 9 has contributed to:

- the introduction of new educational technology, such as MOOCs, virtual reality, augmented reality, and gamification to faculty members; and the presentation of workshops about e-learning at other large medical sciences universities in the macro-region 9; and planning to hold educational fellowships in the field of e-learning.

- an increase in faculty members' motivation, interest, and flexibility in using new teaching methods, both virtual and hybrid, in their courses, and an increase in student access to faculty content, and creating a dynamic movement in the universities of the macro-region 9 to establish e-learning standards.

- the production of mass electronic content in the field of medical sciences by faculty members, and the generation of income from sales of virtual education products.

- This research is a kind of the scholarship of teaching and learning (SOTL), faculty development efforts to enhance teaching and learning is one of the main topics in SOTL. As such, SOTL surrounds aspects of professional faculty development, such as how teachers can develop their professional teaching expertise, i.e., how to better teach students in the field or enable their

learning in the digital age. It also encompasses the study and implementation of more modern teaching methods, such as online collaborative learning, blended learning and, hybrid learning.

- the achievement of scientific leadership in the field of virtual education among the medical sciences universities in the northeast of Iran by the National Agency for Strategic Research in Medical Education: *NASR* (Yazdani & Hoseini, 2020).

- the attraction of new faculty members with e-learning expertise and the initial approval of the Secretariat of the Council for the Development of Medical Sciences Universities in the *Balanced National Document on Health Higher Education in Iran on the Horizon of 2030: macro-region 9*, to establish an academic department in e-learning at the university as a Master of Science degree for the first time in the macro-region 9 (Secretariat of the Council for the Development of Medical Sciences Universities, 2020).

- Establishment of a Virtual Education Center under the standards of the Virtual University of Medical Sciences of the Ministry of Health.

- the presentation of teaching courses through virtual education when dealing with epidemics, such as the Coronavirus, and seasonal diseases, and the closure of universities.

- Achieving 15th rank in the development of virtual education among medical sciences universities across the country: *RAD 3* (Ershadi et al., 2020).

Conclusion

The use of *Teaching in a Digital Age* (Bates, 2015) in workshops and personal consultations at an Iranian university and in a blended-learning course at an Austrian university has inspired faculty members and students to broaden and deepen their knowledge about educational technology, the production of content for technology-supported learning via MOOCs, and media-supported teaching and learning. *Teaching in a Digital Age* is a seminal book in the field of educational technology; and its author, A. W. Bates, is a leading educational theorist in the field. Applying the models presented in his book to academic settings can lead to effective e-teaching and e-learning. For this reason, the authors attempted to implement the book's insights in their academic settings. Both authors achieved positive results in their academic environments. Parts of the first edition of *Teaching in a Digital Age* have been translated into Farsi and are available on the BCcampus site, while a German translation is not yet available. A Farsi translation of the second edition will be completed by the end of 2021. The authors hope that the second edition will lead to additional translations of the book that serves as an excellent resource for educators to become acquainted with media-supported teaching and learning.

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References

Aldahmani, S., Al-shami, S. A., Adil, H., & Sidek, S. (2020). A Review paper on MOOCs development stages, types, and opportunities, and challenges. *Systematic Reviews in Pharmacy, 11*(12), 172-179.

Anderson, T. (2008). *The theory and practice of online learning*: Athabasca University Press.

Bates, A. W. (2015). *Teaching in a digital age: Guidelines for teaching and learning* (1st ed.). Tony Bates Associates Ltd. https://opentextbc.ca/teachinginadigitalage/

Bates, A. W. (2019a). *Teaching in a digital age: Guidelines for teaching and learning* (2nd ed.). Tony Bates Associates Ltd. https://pressbooks.bccampus.ca/teachinginadigitalagev2/

Bates, A. W. (2019b, January 13). *Introduction to From Blackboard to MOOC* [Video]. https://www.youtube.com/watch?v=llTfFy6nKSQ&t=9s

Bates, A. W., & Poole, G. (2003). *Effective teaching with technology in higher education: Foundations for success*. Jossey-Bass Publishers.

Baumgartner, P. (2004, September 29–October 1). *The Zen art of teaching: Communication and interactions in e-education* [Paper presentation]. International Workshop ICL2004, Villach, Austria. Kassel University Press. https://portfolio.peter-baumgartner.net/publication/2004-01-01_baumgartner_zen_2004/

Blazé, K. L. (2011). *Applying SECTIONS to selecting appropriate learning technology* [Diagram], Ringwood North, Australia. http://learningspark.com.au/2017/teaching-with-technology

Duzenlı, H. (2018). *Teaching in a digital age: Guidelines for designing teaching and learning for a digital age*. Turkish Online Journal of Distance Education, *19*(2), 218-219. https://dergipark.org.tr/en/download/article-file/458693

Ershad, S.R., Bahaaldini, K., Jahani, Y., Khazaneha, M., Halavati, I., Dashti, M., Dehghani, MR., Sharififar, F., Shoghi, A.F., Fasihi, M., & Yazdani, S.H. (2020). *Educational ranking of the Iranian universities of medical sciences* 2019- 2020: (*Rad 3*). Farhang Publisher.

Ghoneim, A. (2019). *eEdu13_bildungstech2* [PowerPoint slides]. Department of Continuing Education Research and Educational Technology, Danube University Krems. https://imbmahara.donau-uni.ac.at/view/view.php?id=21

Himpsl, K. (2010). *E-Portfolios in berufsbegleitenden Studiengängen zu Neuen Medien* [E-portfolios in part-time courses on new media]. *MedienPädagogik: Zeitschrift für Theorie Und Praxis Der Medienbildung*, *18*, 1–25. https://doi.org/10.21240/mpaed/18/2010.05.02.X

Keshavarz, M. (2019, January 16). *From blackboard to MOOC* [Workshop]. Department of Medical-Education Development. Mashhad University of Medical Sciences, Iran. http://edc.mums.ac.ir/kargah/484-workshop5

Keshavarz, M. (2019, February 13). *Introduction on MOOCs* [Workshop]. The fourth part, Department of Medical-Education Development. Mashhad University of Medical Sciences, Iran. http://edc.mums.ac.ir/kargah/487-elearningworkshop

Keshavarz, M. (2019, September 25). *Introduction on MOOCs* [Workshop]. Department of Medical-Education Development. Bojnurd University of Medical Sciences, Iran. http://nkums.ac.ir

Kocdar, S. (2017). Designing teaching and learning for a digital age. *The International Review of Research in Open and Distributed Learning, 18*(3). https://doi.org/10.19173/irrodl.v18i3.3107

Mayer, R. E. (2009). *Multimedia learning* (2nd ed.). Cambridge University Press. https://doi.org/10.1017/CBO9780511811678

Mulyono, H. (2018). Teaching in a digital age. *Teaching English with Technology*, *17*(4), 93-96. https://www.ceeol.com/search/article-detail?id=579135

Multimedia Educational Resource for Learning and Online Teaching (MERLOT). (2019). *Teaching in a digital age*. MERLOT Material. https://www.merlot.org/merlot/viewMaterial.htm?id=1165883

Secretariat of the Headquarters for Transformation in Education. (n.d). *Universities of the macro-region 9*. Mashhad University of Medical Sciences, Iran. https://ielpc.mums.ac.ir/

Secretariat of the Council for the Development of Medical Sciences Universities. (2020, December 13). *Balanced national document on health higher education in Iran on the horizon of 2030*. Unpublished document, Latest news and announcements, Ministry of Health and Medical Education, Iran. https://oee.behdasht.gov.ir/

Teacher Education. (2018). Teaching in a digital age: Guidelines for designing teaching and learning for a digital age [Peer review]. *MERLOT*. https://www.merlot.org/merlot/viewCompositeReview.htm?id=1356177

Virtual Education Center. (2018, August 30). *Launching the first professional and standard studio of image and sound in the east of the country,* Torbat Heydariyeh University of Medical Sciences, Iran. http://vec.thums.ac.ir/

Virtual University of Medical Sciences. (2018). *The first meeting of the Scientific Committee of the ARMAN Council*. Deputy of Infrastructure. http://vums.ac.ir/?p=15020

Virtual University of Medical Sciences. (2019a). *New and massive national computerized education (ARMAN)*. http://arman.vums.ac.ir/search/index?selectedProvider=62

Virtual University of Medical Sciences. (2019b). *The national MOOCs Scientific Committee (ARMAN)*. Deputy of Infrastructure. http://vums.ac.ir/?p=17934

Yazdani, S.H., & Hoseini, A.M (2020). *Scientific supremacy in Torbat Heydariyeh University of Medical Sciences and Health Services*: *From an unattainable dream to an achievable ideal*. National Agency for Strategic Research in Medical Education (NASR). https://nasrme.ac.ir/macro-region/

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Resonance and Current Relevance of IRRODL Highly-Cited Articles: An Integrative Retrospective

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Abstract

This paper provides an integrative-retrospective analysis of highly-cited articles from past issues of the *International Review of Research in Open and Distributed Learning* (*IRRODL*). Download metrics of published articles were used to identify the top 100 downloaded IRRODL articles from 2000–2020. Publicly-available citation metrics for the top 100 articles were used to further refine the analysis and identify the top 10 most-cited IRRODL articles. These articles were then categorized into resonant themes to frame a discussion of the key topics in present-day online and distributed learning research and pedagogy. This paper is intended to provide a broad overview and will be of interest to those who are new to the field of online learning.

Keywords: community, connectivism, interaction, OER

Introduction

The 2020 global COVID-19 pandemic, and the way it abruptly disrupted the educational landscape, has shed considerable light on a variety of open and distributed education considerations. As a long-time student of distance education and a parent of a 1st-year university student, I have watched with great interest as traditional brick and mortar institutions attempt to move quickly from classroom-based to online learning. It seems somewhat ironic that in this transition many traditional institutions of higher education make, what appears to be, no attempt to understand the evidence and scholarship from years of distance education practice. There is a large and growing body of research that can better inform the transition to online learning.

Terms, such as *emergency remote teaching, pandemic pedagogy, hybrid learning, hyflex learning,* and *online pivot*, proliferate in academic discourse on a variety of social media and professional learning network platforms. However, the lexicon is less important than the intent and underlying assumptions, as well the practical specifics of what is being attempted. Many traditional institutions view the transition to fully online or blended learning as burdensome and temporary. They consider, without evidence, online learning as being of lesser quality than classroom-based learning. Although the circumstances of the pandemic have necessitated rapid change, the evidence to guide this shift and, quite possibly, create sustainable and positive change has long been established. This body of evidence has been provided by scholars and practitioners who have had the time and experience to provide reasoned research and reflection. As Shattuck (2020) advises, "distance education literacy begins with the literature" (p. 179).

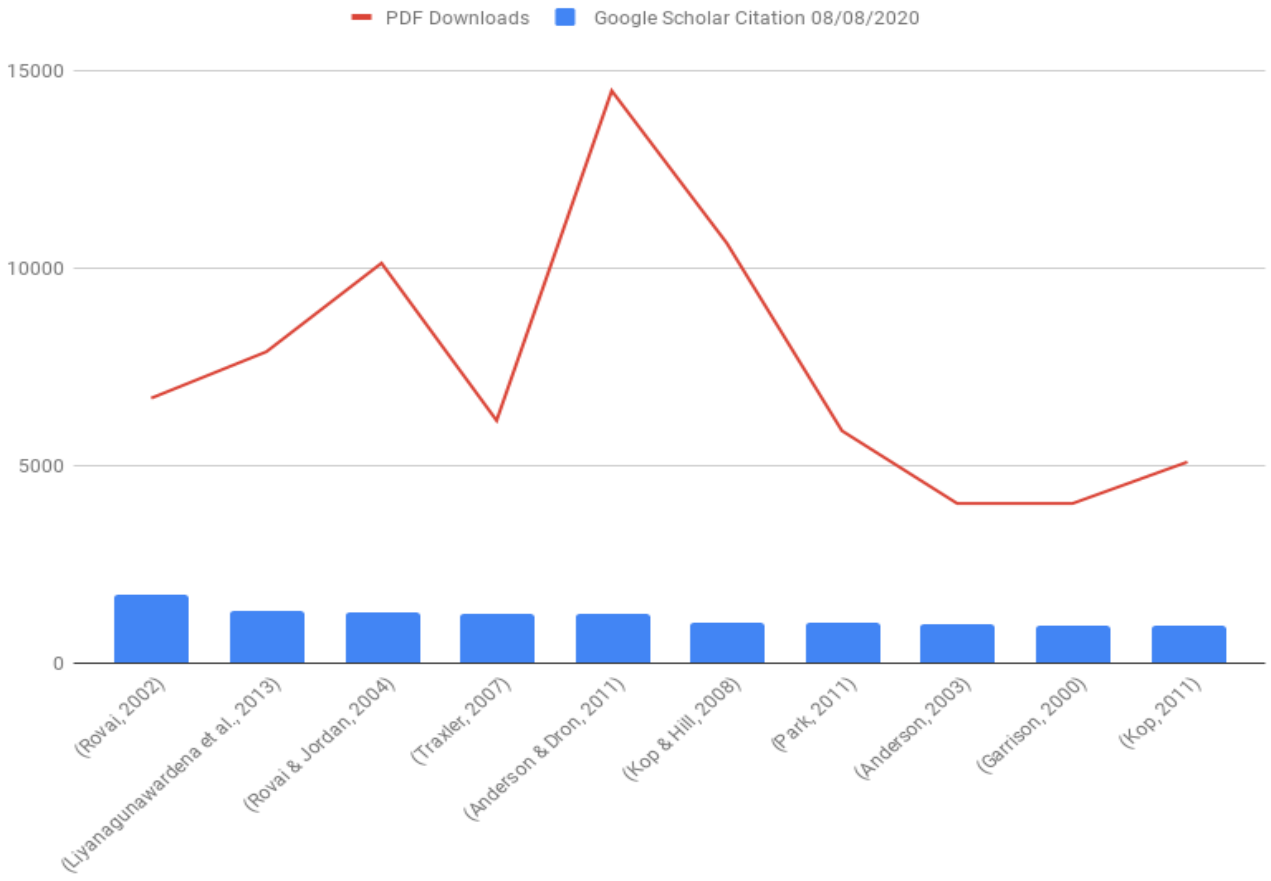
Coincidently, 2020 marks 20 years of publication of the *International Review of Research in Open and Distributed Learning* (IRRODL). There is no better time to undertake a retrospective study of the top IRRODL articles and strands of investigation that have left an enduring imprint through their impact on the field. This article provides an integrative content analysis of 20 years of open, online, distance, and distributed learning research, anchored by the top 10 most-cited IRRODL articles, according to Google Scholar on August 8, 2020.

Methods

Since 2000, the IRRODL has published more than 1,400 scholarly articles on issues related to open and distributed learning (ODL). The publication corpus primarily includes refereed research articles, along with notes from the field, book reviews, literature reviews, and special issues. In preparation for this retrospective study, all IRRODL articles from 2000–2020 were sorted by the number of PDF downloads; then, the top 100 downloaded articles were compared based on a variety of citation and utilization metrics, including Google Scholar citations, PlumX citation indexes, and Altmetrics, including social media mentions, and reference manager downloads. The IRRODL offers a number of format types, but the correlation between article downloads and citations has been established in a preceding bibliometric analysis of the journal (Martínez & Anderson, 2015). Though, in the present analysis, no direct article-to-article correlation was made. Figure 1 combines the number of PDF downloads of the top 10 IRRODL articles with their corresponding Google Scholar citation metrics during the same week in August 2020.

Figure 1

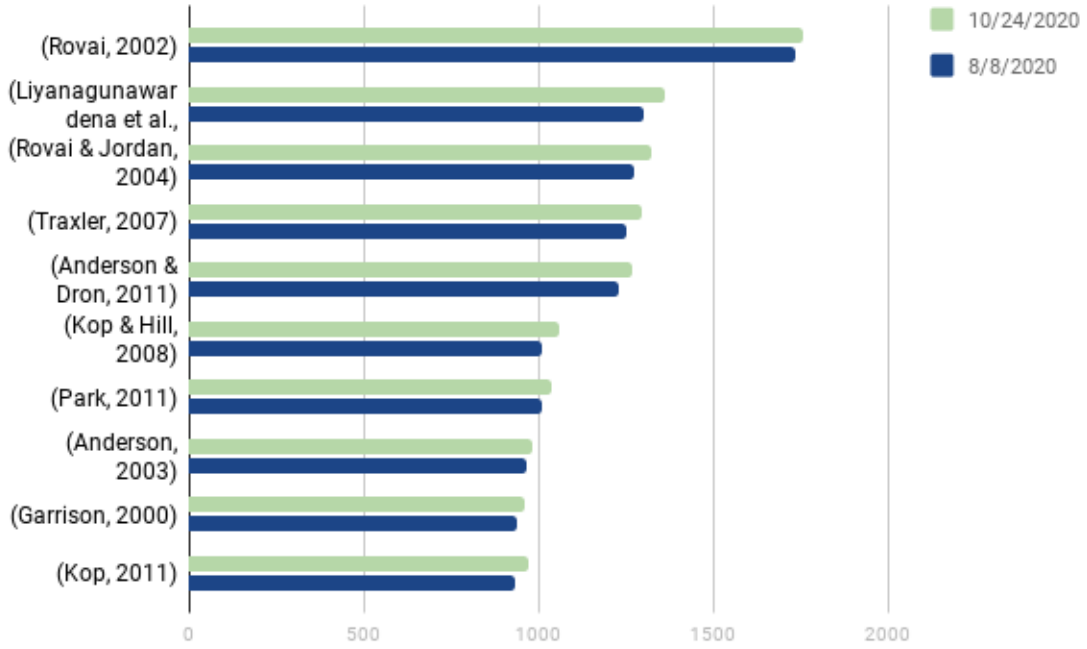
PDF Downloads and Google Scholar Citation Metrics of the Top 10 IRRODL Articles



The goal of this analysis was to generate a list of the top 10 articles in terms of their enduring impact on the field of ODL. Figure 2 outlines the top 10 citation list in ascending order as identified by Google Scholar citation metrics on August 8, 2020 and on October 24, 2020.

Figure 2

Google Scholar Citation Metrics of the Top 10 IRRODL Articles in a 3-Month Period



Research impact is both a quantifier and qualifier, depending on the purpose and type of metric used. There is no formalized agreement on either the definition or utility of citation indices (Penfield et al., 2014). However, it is known that open access journals, like the IRRODL, tend to have a higher research impact than other journals in general (Antelman, 2004; Björk & Solomon, 2012). This article will not repeat the cogent articulation of the problems with automated-quantitative citation metrics offered by many authors, including Anderson (2009) in the IRRODL editorial "The Ratings Game."

Impact and citation indexing are both vague and mutable, especially when contrasting 20-year-old articles to more recently published articles, where a broader variety of access options and impact indicators are available. On the same theme, the longevity of an article's use is an important indicator (Fahy, 2013). In this regard, Figure 2 depicts the citation increase of the top 10 IRRODL articles throughout the duration of this study, indicating the continued and recent growth of citations.

That said, the purpose of this article is to provide a more qualitative, integrative-retrospective description rather than rely purely on the quantitative data. Specifically, this article explores the top-10 cited articles as guideposts to highlight content areas that have, at times, sparked a line of research or garnered continued interest in the field of ODL. This analysis consists of a thematic content analysis of some of the more impactful articles and a discussion on why these articles continue to resonate and, therefore, provide important fodder for consideration in present-day ODL inquiry, framed by the immediacy of the COVID-19 pandemic.

Key Themes in Online and Distance Learning Research and Pedagogy

The sudden uptake in interest in online and distance learning at all educational levels is a direct result of the unplanned need to pivot classroom-based learning environments to online learning environments to maintain educational continuity during the COVID-19 pandemic. But, like a Global Positioning System (GPS), we must set the direction for where we are headed by first taking stock of where we are in terms of knowledge about online and distance learning. This is made possible by the long history of educational technology research, a deep and wide field from which to take direction. It is not surprising that some of the most frequent questions about the pivot to online learning have already been asked, answered, and re-asked across 20 years of IRRODL publications.

Content analysis of the top-10 cited articles uncovers investigations about building community online, student interaction, theoretical foundations of online and distance learning, connectivism, massive open online courses (MOOCs), and mobile learning. These themes have continued to resonate with those interested in scholarship within the field of online and distance learning. Two additional thematic areas are included in this discussion because they form a substantial body of IRRODL articles or offer important insights into some of the most pressing questions about moving traditional classrooms online. These topics are covered as open educational resources (OER)/open educational practices (OEP) and comparisons of classroom-based and online learning.

Building Community Online

Community building in online environments continues to be an area of significant interest. Studies about community started by considering questions of whether or not face-to-face (f2f) learning communities can be replicated online. Today, a more complex understanding has led us to believe that replication may not be the best goal and that some of the benefits of community building online, using asynchronous communications, can be more significant than what can be achieved in time- and space-bound, face-to-face classes (Garrison & Anderson, 2003). Scholarship on community building spans the entire publication life of the IRRODL.

Under the theme of community building, Alfred Rovai contributed two of the top 10 IRRODL articles. “Building Sense of Community at a Distance” (Rovai, 2002) is the most-cited IRRODL article and has been cited more than 1,751 times since its publication. Citation metrics were sourced on several dates throughout August 2020, and continued citation shows that this article has enduring resonance and relevance. Rovai’s (2002) article had already amassed 74 citations in the first 9 months of 2020. Scholars across diverse disciplines continue to rely on his article.

Rovai (2002) draws together many important foundational studies, including Garrison et al.’s (2000) seminal article on community of inquiry, to assert that not only is community building possible in online and distance learning, it is a pedagogical imperative directly correlated to seven key community building considerations. Rovai’s second article in this theme, together with Hope Jordan, is ranked number three. In this article, “Blended Learning and Sense of Community: A Comparative Analysis With Traditional and Fully Online Graduate Courses,” Rovai and Jordan (2004) investigate perceptions of community in face-to-face versus blended-learning environments and conclude that sense of community was stronger in the blended format.

The field and the variety of distance delivery tools, social media, and mobile devices and their affordances have come a long way since the question of online learning communities emerged. There is a significant body of literature that points to the why, how, and learning impact of community building in online and distance learning. Community building remains an important topic in 2020. The *2020 EDUCAUSE Horizon Report* centres on the idea of socially-informed learning and calls on educators to consider going beyond community formation to include a deeper understanding of equity, diversity, and mental-health informed pedagogy within a learning community (EDUCAUSE, 2020). As Rovai (2002) suggests, an important part of community building is considering the "four dimensions: spirit, trust, interaction, and commonality of expectation and goals, in this case, learning" (p. 4).

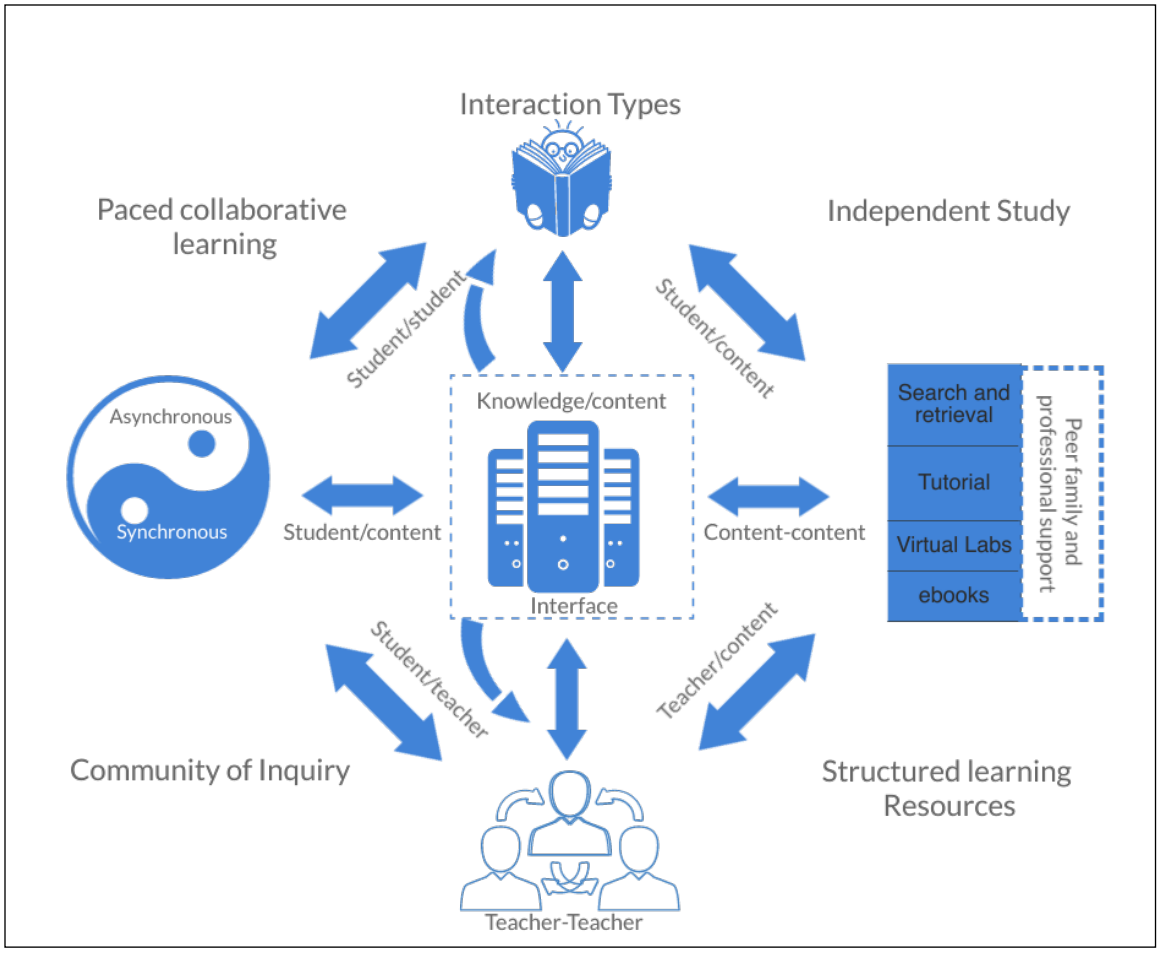
In the years since Rovai's IRRODL articles, many scholars have added an important voice to the practical application of emotional attuning, and the instructor training needed to enact it, to create equitable, transformative, and interactive learning communities (Bali & Caines, 2018; Cleveland-Innes, 2019). Not surprisingly, investigations into designing for interaction form another highly-cited thematic area in the IRRODL.

Learner Interaction

In "Getting the Mix Right Again: An Updated and Theoretical Rationale for Interaction," Terry Anderson (2003) opines that getting the interaction mix right in a learning community is a complex endeavour. Anderson (2003) could not have predicted how closely his words would resonate in 2020 when he wrote, "the landscape and challenges of 'getting the mix right' have not lessened in the past 25 years, and, in fact, have become even more complicated" (p. 1). In this article, Anderson presents the interaction equivalence theorem, a theory that has guided numerous later studies on online interaction (Figure 3).

Figure 3

Types of Interaction



Note. Adapted from *A Model for Online Learning,* by Terry Anderson, 2003, IRRODL (https://doi.org/10.19173/irrodl.v4i2.149). CC BY 4.0.

It is impossible to do the breadth of the theorem justice in a short article. The theorem is, essentially, based on the premise that online learning interaction is largely distributed among three main types of interaction (i.e., learner-learner, learner-instructor, learner content) and that instructional design choices can be balanced with what is doable and available without losing educational integrity (Anderson, 2003).

In 2020, as educational institutions struggle to determine how to make the pivot to online learning, "getting the mix right" is a constant challenge. Educators with no experience in distance education routinely replicate existing 2-to-3-hour classroom-based time slots in online synchronous sessions and then erroneously conclude that distance education is not as effective. But the mix matters, and it matters even more now as we experiment with class types, ages, and stages that have yet to experience the benefits of the right mix or of theoretically-grounded online and distance learning. Anderson's study has enduring relevance as interaction affordances and interactive content types continue to evolve.

Theoretical Foundations of Online and Distance Learning

Two more articles in the top 10 citation list focus on the theoretical grounding necessary to deliver quality online and distance learning: "Three Generations of Distance Education Pedagogy" (Anderson & Dron, 2011) and "Theoretical Challenges for Distance Education in the 21st Century: A Shift From Structural to Transactional Issues" (Garrison, 2000). In their article, Anderson and Dron (2011) take an important retrospective look at the roots of three major theoretical families that have influenced distance education: cognitive-behavioural, social constructivist, and connectivist theories. They analyze each of the theoretical families alongside cognitive, teaching, and social presence descriptors. Key messages help readers understand that context matters in designing for quality in distance education and that one generation of distance learning pedagogy does not supersede another in the design of the distance learning ecology. In a poignant and present COVID-related contention, Anderson and Dron state (2011) that "different models of teaching and learning have evolved when the technological affordances and climate were right for them" (p. 90). Definitely food for thought in the pandemic climate.

Garrison's (2000) article, which appeared more than 10 years earlier, seeded this line of thinking in its review of a century of distance education considerations and questioned the kinds of distance education theory that will develop into the 21st century. The subject of transactional distance is discussed in most of the top 10 IRRODL articles, showing that this construct is a foundational part of understanding distance education delivery. Garrison's (2000) article appeared in the IRRODL's 1st year of publication; yet it has likely never been more important than it is now, as so many educational organizations are struggling to redesign learning with socially-safe-distance in mind.

Connectivism

Along the lines of theoretical development, Rita Kop contributed two of the top 10 IRRODL articles (Kop, 2011; Kop & Hill, 2008). In "Connectivism: Learning Theory of the Future or Vestige of the Past?" Kop and Hill (2008) agree with Garrison (2000), and Anderson and Dron (2011), about the need for a comprehensive theory of distance education. In their literature synthesis, Kop and Hill (2008) discuss the emergence of connectivism and, in particular, the discourse around its position as a theory. In 2005, Siemens and Downes described connectivism in two separate papers (Downes, 2005; Siemens, 2005). The principles of connectivism certainly fit in well with the three prior themes, including the idea that learning and knowing come from a diversity of opinions that can be accessed through technological interactions both human and non-human (Siemens, 2005). However, Kop and Hill (2008), conclude that connectivism may not be sufficiently developed to be positioned as a comprehensive theory of distance education.

Three years later, Kop (2011), in her single-authored article, "The Challenges to Connectivist Learning on Open Online Networks: Learning Experiences During a Massive Open Online Course," moves away from the theoretical foundations of connectivism to the more practical enactment of connectivist MOOCs. The fact that both of Kop's articles appear in the top 10 citation list speaks to a great interest in the idea of connectivism by both established and emerging scholars; though, both articles highlight the idea that citation rates should not always be considered an endorsement, as their assessment of connectivist learning design demonstrates. That said, the sustained interest in connectivism is evidenced by the fact that it is the topic of 10 more IRRODL articles published from 2009 through 2018. Furthermore, the resonant ideals that are the foundations of connectivist learning, including learner autonomy and self-led learning design

appear in other pedagogical terminologies, including heutagogy and rhizomatic learning. Connectivism is also often tied to learning in MOOCs, another theme that emerged within the top 10 IRRODL articles.

MOOCs

The IRRODL has published more than 55 articles about MOOCs in its 20-year history. It is a topic that continues to resonate because of a variety of factors, including access and openness. It is not surprising then that "MOOCs: A Systematic Study of the Published Literature 2008–2012," by Liyanagunawardena and colleagues (2013), ranks number two for all-time citations. Since their emergence in 2008, research about MOOCs spans a variety of configurations and contexts. Liyanagunawardena et al.'s (2013) systematic review article categorizes this research along eight important dimensions, offering insight about specific case studies, educational theory, technology used in MOOCs, and participant and provider characteristics.

In 2020, MOOCs continue to resonate in the field of ODL and are an important topic in terms of the pandemic pivot toward online learning. MOOCs have seen a sudden resurgence since the pandemic started (Bates, 2020). This may be partly attributed to the fact that many of the early attempts to help both instructors and learners navigate the suddenness of the shift were offered in the form of MOOCs by a handful of universities that have significant experience in the field. Athabasca University and the Commonwealth of Learning were instrumental in delivering a series of MOOCs to aid in the shift to technology-informed instruction (TELMOOC), building community online (BLPMOOC), and new learner orientation (LTLO). One of the factors that contribute to the appeal of MOOC learning is accessibility, and access options, including the fact many MOOC infrastructure providers offer lower-bandwidth, mobile learning applications.

Mobile Learning (m-Learning)

Mobile learning or m-learning has been an important area of publication in the IRRODL. The IRRODL has published more than 45 articles on the subject, including a special issue in 2007. It is not surprising then that two m-learning articles appear in the top 10 citation list. In "Defining, Discussing and Evaluating Mobile Learning: The Moving Finger Writes and Having Writ…." Traxler (2007) provides a cogent history of the development of m-learning and asks some of the same questions that appear in this retrospective of IRRODL articles about theoretical grounding. Traxler ends the article with the suggestion that in 2007 there are more questions than answers, but that "the synergy between mobile learning and distance learning…holds enormous potential" (Traxler, 2007, p. 10). Four years later, Park (2011) undertook part of Traxler's theoretical challenge. In "A Pedagogical Framework for Mobile Learning: Categorizing Educational Applications of Mobile Technologies Into Four Types," Park analyzes the affordances of m-learning on the backdrop of Michael Moore's seminal concept, *transactional distance*.

Mobile learning in all its forms continues to resonate throughout the world. Traxler and Park could not have known how important the affordances of mobile learning would become during a global pandemic. The pandemic brought to light how many learners all over the world, in both developed and underdeveloped countries, do not have access to reliable internet; and cellular or mobile device access became the only way that educational continuity could be attempted.

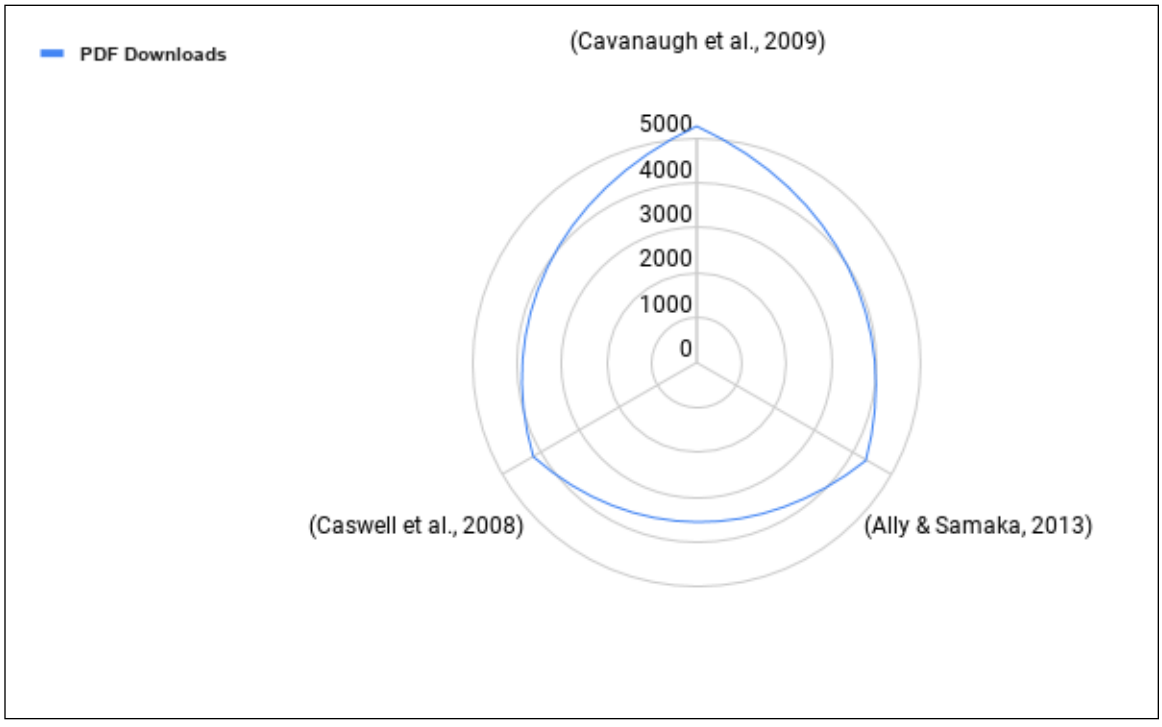
Open Educational Resources (OER)

In the time since the IRRODL started publication, more than 110 articles have focused on a variety of OEP and OER. Three special issues have been devoted to open practices: In 2013, *Open Educational Resources: Opening Access to Knowledge* (McGreal, 2013); in 2015, *OER and MOOCs* (McGreal, 2015); and in 2017, *Outcomes of Openness: Empirical Reports on the Implementation of OER* (McGreal, 2017). While no particular article on OER appears in the top 10 citation list, OER articles have enjoyed an extensive readership in the 20 years of the IRRODL's publication.

The pandemic pivot to online learning has, in many ways, highlighted the need for both OER and OEP. Articles about mobile learning and OER, universal education, and K-12 research and practice have proven very popular, with large numbers of PDF downloads. The concept of OER continues to grow in both awareness and complexity. Figure 4 shows the three most downloaded IRRODL articles on the theme of OER, each of which was downloaded more than 4,000 times: "Open Education Resources and Mobile Technology to Narrow the Learning Divide" (Ally & Samaka, 2013), "Open Content and Open Educational Resources: Enabling Universal Education" (Caswell et al., 2008), and "Research and Practice in K-12 Online Learning: A Review of Open Access Literature" (Cavanaugh et al., 2009).

Figure 4

The Top Three OER Articles in the IRRODL by PDF Downloads



Attention to the affordances that embracing OER and OEP can provide in terms of access has been amplified due to the pandemic. For several years, the adoption of OER has been highlighted as an important *Horizon*

Report educational trend (Johnson et al., 2015). Pedagogical shifts have also been highlighted in a UNESCO directive that states,

> the COVID-19 crisis has resulted in a paradigm shift on how learners of all ages, worldwide, can access learning. It is, therefore, more than ever essential that the global community comes together now to foster universal access to information and knowledge through OER (Huang et al., 2020, p. 3).

OER and OEP have many benefits that are in direct alignment with the themes discussed in this paper, including diverse community building, increased interaction, and improved digital pedagogy (Adam et al., 2020; Jhangiani, 2020).

Classroom-Based – Online Comparison

No discussion about the pandemic pivot to online learning would be complete without highlighting historical articles that specifically speak to the proclivity to draw comparisons between classroom-based and online distance learning. "Online learning carries a stigma of being lower quality than face-to-face learning, despite research showing otherwise" (Hodges et al., 2020, para. 4). Those who have studied distance learning know that when it comes to quality and learning outcome efficacy, numerous studies spanning decades have concluded there is *no significant difference* between them (National Research Center for Distance Education and Technological Advancement, 2019; Russell, 1999). In fact, some of the authors in the top 10 citation list have highlighted ways in which distance learning may be superior in terms of educating for critical thinking, facilitating critical discourse, and prompting reasoned reflection (Garrison & Anderson, 2003).

Garrison and Anderson (2003) advise that educational opportunity afforded via the internet "does not represent a reinvention of the educational transaction. But it does call for a refocusing and rededication to traditional higher education ideals…ideals that can be brought back within our grasp by technological developments" (p. 18). This sentiment exemplifies the idea that attentive use of technology can support meaningful educational goals.

One of the top downloaded IRRODL articles in this theme is coincidently titled "Replacing Face-To-Face Tutorials by Synchronous Online Technologies: Challenges and Pedagogical Implications," written by Kwok Chi Ng in 2007. Long before the world was thrust into panic and continuity-driven substitution behaviour, Ng found that in straight replication of classroom-based learning to online learning, students "indicate dissatisfaction with the one-way communication and teacher-control functionalities of the system" (Ng, 2007, p. 1). This finding highlights the importance of many of the themes discussed above, in terms of distribution of knowledge, and reiterates the necessity to bridge the move to online educational offerings with considered reflection from the literature.

Conclusion

Collectively, the IRRODL articles that have been often cited, downloaded, and viewed tell us a cogent story. The frequency and recency of the citations of some of the older articles point to a continued interest in some of the foundational elements of quality ODL design. Purposeful attention to pedagogical theory, transactional distance, interaction, community building, and equitable and sustainable open access and mobile access options is much more important than replicating classroom-based content structures and lecture-based or transmission-based teaching methodologies that all too often dominate traditional educational structures.

When considered together, the often-cited articles and the content analysis show that negotiating the shift to online learning in a beneficial way is as much an educator mind shift as it is a shift in delivery modality. "Education is a purposeful activity, and theory provides us with the understanding necessary to take effective action" (Garrison, 2000, p. 3). When we as educators respond to the call for the development of a deeper understanding of equity, diversity, and mental-health informed pedagogy within a learning community (EDUCAUSE, 2020); we realize that there is room to look more deeply at some of the democratic, distributed, and open affordances that well-planned ODL can offer.

In a recent webinar about the future of campus culture, hosted by the University of Toronto Press, the pandemic reality was referred to as "a reckoning." The reckoning was described as a time to review some of the historic educational practices that are based on structures of controlled time, voice, and content (James et al., 2020). These frequent calls may be best addressed by adopting an empathetic lens and spending time in the shoes of distance education students. The mastery of online learning pedagogy is much more than a pivot. It is a worthwhile investment to be a student of good ODL practices and a student of literature, by pursuing the 20 years of scholarship that the IRRODL has to offer. Happy Anniversary IRRODL.

References

Adam, T., Allen, N., Amiel, T., Asino, T., Atenas, J., Bali, M., Barnes, N., Bourg, C., Bouterse, S., Caines, A., Campbell, L. M., Cangialosi, K., Collier, A., Cronin, C., Czerniewicz, L., DeRosa, R., Ensor, S., Friedrich, C., Gilliard, C., … Watters, A. (2020). *Open at the margins: Clinical perspectives on open education*. Rebus Community. https://press.rebus.community/openatthemargins/

Ally, M., & Samaka, M. (2013). Open education resources and mobile technology to narrow the learning divide. *The International Review of Research in Open and Distributed Learning*, *14*(2), 14–27. https://doi.org/10.19173/irrodl.v14i2.1530

Anderson, T. (2003). Getting the mix right again: An updated and theoretical rationale for interaction. *The International Review of Research in Open and Distributed Learning*, *4*(2). https://doi.org/10.19173/irrodl.v4i2.149

Anderson, T. (2009). The ratings game. *The International Review of Research in Open and Distributed Learning*, *10*(3). https://doi.org/10.19173/irrodl.v10i3.742

Anderson, T., & Dron, J. (2011). Three generations of distance education pedagogy. *The International Review of Research in Open and Distributed Learning*, *12*(3), 80–97. https://doi.org/10.19173/irrodl.v12i3.890

Antelman, K. (2004). Do open-access articles have a greater research impact? *College & Research Libraries*, *65*(5), 372–382. https://doi.org/10.5860/crl.65.5.372

Bali, M., & Caines, A. (2018). A call for promoting ownership, equity, and agency in faculty development via connected learning. *International Journal of Educational Technology in Higher Education*, *15*(46). https://doi.org/10.1186/s41239-018-0128-8

Bates, A. W. (2020). *MOOCs and online degrees continue to grow worldwide*. https://www.tonybates.ca/2020/09/08/moocs-and-online-degrees-continue-to-grow-worldwide/

Björk, B.-C., & Solomon, D. (2012). Open access versus subscription journals: A comparison of scientific impact. *BMC Medicine*, *10*(73). https://doi.org/10.1186/1741-7015-10-73

Caswell, T., Henson, S., Jensen, M., & Wiley, D. (2008). Open content and open educational resources: Enabling universal education. *The International Review of Research in Open and Distributed Learning*, *9*(1). https://doi.org/10.19173/irrodl.v9i1.469

Cavanaugh, C. S., Barbour, M. K., & Clark, T. (2009). Research and practice in K-12 online learning: A review of open access literature. *The International Review of Research in Open and Distributed Learning*, *10*(1). https://doi.org/10.19173/irrodl.v10i1.607

Cleveland-Innes, M. (2019). The community of inquiry theoretical framework: Designing collaborative online and blended learning. In H. Beetham & R. Sharpe (Eds.), *Rethinking pedagogy for a digital age: Principles and practices of design* (3rd ed.). Routledge. https://doi.org/10.4324/9781351252805

Downes, S. (2005, December 22). *An introduction to connective knowledge*. https://www.downes.ca/post/33034

EDUCAUSE. (2020). *2020 EDUCAUSE Horizon Report. Teaching and Learning Edition*. EDUCAUSE Publications. https://library.educause.edu/resources/2020/3/2020-educause-horizon-report-teaching-and-learning-edition

Fahy, P. J. (2013). Uses of published research: An exploratory case study. *The International Review of Research in Open and Distributed Learning*, *14*(1), 145–166. https://doi.org/10.19173/irrodl.v14i1.1382

Garrison, R. (2000). Theoretical challenges for distance education in the 21st century: A shift from structural to transactional issues. *The International Review of Research in Open and Distributed Learning*, *1*(1). https://doi.org/10.19173/irrodl.v1i1.2

Garrison, R. & Anderson, T. (2003). *E-learning in the 21st century: A framework for research and practice* (1st ed.). RoutledgeFalmer. https://doi.org/10.4324/9780203166093

Garrison, R., Anderson, T., & Archer, W. (2000). Critical inquiry in a text-based environment: Computer conferencing in higher education. *The Internet and Higher Education*, *2*(2–3), 87–105. https://doi.org/10.1016/S1096-7516(00)00016-6

Hodges, C., Moore, S., Lockee, B., Trust, T., & Bond, A. (2020). The difference between emergency remote teaching and online learning. *EDUCAUSE Review*. https://er.educause.edu/articles/2020/3/the-difference-between-emergency-remote-teaching-and-online-learning

Huang, R., Liu, D., Tlili, A., Knyazeva, S., Chang, T., Zhang, X., Burgod, D., Jemni, M., Zhang, M., Zhuang, R., & Holotescu, C. (2020). *Guidance on open educational practices during school closures: Utilizing OER under COVID-19 pandemic in line with UNESCO OER recommendation*. Smart Learning Institute of Beijing Normal University. https://iite.unesco.org/wp-content/uploads/2020/05/Guidance-on-Open-Educational-Practices-during-School-Closures-English-Version-V1_0.pdf

James, C. E., Kitossa, T., Quinless, J., & Stern, K. (2020, October 13). *Debating at a (social) distance: The campus in the COVID era* [Webinar]. University of Toronto Press. https://utorontopress.com/us/events/index/view/id/241

Jhangiani, S. (2020, October 8). OER Fund(ed): Diverse voices and "beyond the classroom" projects [Interview with Surita Jhangiani]. *Open UBC*. https://open.ubc.ca/oer-funded-diverse-voices-and-beyond-the-classroom-projects/

Johnson, L., Adams-Becker, S., Estrada, V., & Freeman, A. (2015). *NMC Horizon Report: 2015 higher education edition*. The New Media Consortium. https://library.educause.edu/-/media/files/library/2015/2/hr2015-pdf.pdf

Kop, R. (2011). The challenges to connectivist learning on open online networks: Learning experiences during a massive open online course. *The International Review of Research in Open and Distributed Learning*, *12*(3), 19–38. https://doi.org/10.19173/irrodl.v12i3.882

Kop, R., & Hill, A. (2008). Connectivism: Learning theory of the future or vestige of the past? *The International Review of Research in Open and Distributed Learning*, *9*(3). https://doi.org/10.19173/irrodl.v9i3.523

Liyanagunawardena, T. R., Adams, A. A., & Williams, S. A. (2013). MOOCs: A systematic study of the published literature 2008–2012. *The International Review of Research in Open and Distributed Learning*, *14*(3), 202–227. https://doi.org/10.19173/irrodl.v14i3.1455

Martínez, R. A., & Anderson, T. (2015). Are the most highly cited articles the ones that are the most downloaded? A bibliometric study of IRRODL. *The International Review of Research in Open and Distributed Learning*, *16*(3). https://doi.org/10.19173/irrodl.v16i3.1754

McGreal, R. (Ed.). (2013). Open educational resources: Opening access to knowledge [Special issue]. *International Review of Research in Open and Distributed Learning, 14*(2). http://www.irrodl.org/index.php/irrodl/issue/view/56

McGreal, R. (Ed.). (2015). OER and MOOCs [Special issue]. *International Review of Research in Open and Distributed Learning, 16*(5). http://www.irrodl.org/index.php/irrodl/issue/view/71

McGreal, R. (Ed.). (2017). Outcomes of openness: Empirical reports on the implementation of OER [Special issue]. *International Review of Research in Open and Distributed Learning, 18*(4). http://www.irrodl.org/index.php/irrodl/issue/view/85

National Research Center for Distance Education and Technological Advancement (DETA). (n.d.). *No Significant Difference*. DETA Research Center Community. Retrieved January 13, 2020, from https://detaresearch.org/research-support/no-significant-difference/

Ng, K. C. (2007). Replacing face-to-face tutorials by synchronous online technologies: Challenges and pedagogical implications. *The International Review of Research in Open and Distributed Learning*, *8*(1). https://doi.org/10.19173/irrodl.v8i1.335

Park, Y. (2011). A pedagogical framework for mobile learning: Categorizing educational applications of mobile technologies into four types. *The International Review of Research in Open and Distributed Learning*, *12*(2), 78–102. https://doi.org/10.19173/irrodl.v12i2.791

Penfield, T., Baker, M. J., Scoble, R., & Wykes, M. C. (2014). Assessment, evaluations, and definitions of research impact: A review. *Research Evaluation*, *23*(1), 21–32. https://doi.org/10.1093/reseval/rvt021

Rovai, A. P. (2002). Building sense of community at a distance. *The International Review of Research in Open and Distributed Learning*, *3*(1). https://doi.org/10.19173/irrodl.v3i1.79

Rovai, A. P., & Jordan, H. (2004). Blended learning and sense of community: A comparative analysis with traditional and fully online graduate courses. *The International Review of Research in Open and Distributed Learning*, *5*(2). https://doi.org/10.19173/irrodl.v5i2.192

Russell, T. L. (1999). *The no significant difference phenomenon as reported in 355 research reports, summaries and papers*. North Carolina State University.

Shattuck, K. (2020). Distance education research literacy begins with the literature. *American Journal of Distance Education*, *34*(3), 179–179. https://doi.org/10.1080/08923647.2020.1802965

Siemens, G. (2005). Connectivism: A learning theory for the digital age. *International Journal of Instructional Technology and Distance Learning*, *2*(1). http://www.itdl.org/Journal/Jan_05/article01.htm

Traxler, J. (2007). Defining, discussing and evaluating mobile learning: The moving finger writes and having writ…. *The International Review of Research in Open and Distributed Learning*, *8*(2). https://doi.org/10.19173/irrodl.v8i2.346