IRRODL

THE INTERNATIONAL REVIEW OF RESEARCH IN OPEN AND DISTRIBUTED LEARNING

Vol 24
No 2

May 2023

International **R**eview of **R**esearch in **O**pen and **D**istributed **L**earning
Volume 24, Number 2

May – 2023

Editorial – Volume 24, Issue 2

Rory McGreal
IRRODL Editor in Chief, UNESCO/COL/ICDE Chair in OER, Athabasca University, Canada

In April, the IRRODL PKP application was ported to an external server and updated to OJS version 3.3. Because of this we were offline for nearly two weeks. We have had glitches in the working of the new environment, which are slowly becoming resolved. I would like to apologise to our readers, authors, and reviewers for any inconveniences these changes may have wrought. We believe that this new IRRODL environment will prove to be more robust and easier to work with for both contributors and staff.

We have also been investigating the potential and the problems that could result from the use of Artificial Intelligence (AI) by researchers, authors, and by our reviewers. We do not believe in banning the use of AI by researchers, but we do insist, for ethical reasons, that when strong AI has been used to assist in the writing of an article, this must be acknowledged by the authors. For example, in APA7 style, see the APA blog on citing ChatGPT. This, of course, does not include spelling and grammar/style checkers. We also welcome submissions about AI related to open and distributed learning. Note that the latest version of Turn-it-in, which we use to scan all submitted articles, now includes detection of AI content.

This issue includes research articles from Turkiye, Ghana, Iran, Iraq, USA, and UK. Issues covered include MOOCs, OER, SDL, LMS, leadership, ethics, and student and instructor perceptions.

The lead article, "Exploring the Influence of Countries' Economic Conditions on Massive Open Online Course (MOOC) Participation: A Study of 3.5 Million MITx Learners," by **Cagiltay**, **Tolker**, and **Cagiltay** highlights the potential of MOOCs to bridge the educational gap between developed and developing countries. Although MOOCs provided low-cost education to all, there were significant differences in the behaviors of learners in developed and developing countries. The authors suggest several actions to help remedy the disparities.

Bradshaw and **McDonald** in their article, "Informal Practices of Localizing Open Educational Resources in Ghana," address a significant gap in OER research, namely how the localization of OER occurs in practice. Their research revealed that localization occurred informally with workarounds, spontaneous translation, cultural recontextualization, content substitutions, social responsiveness, etc. Their findings suggest a need for OER creators to leave space for this informal localization and linguistic flexibility.

From Iran, **Mirmoghtadaie**, **Keshavarz**, **Kohan**, and **Ahmady** write "Developing a Conceptual Model of Self-Directed Learning in Virtual Environments for Medical Sciences Students." Their model was developed and used to explore the formation of a process for graduate students in a virtual environment. The themes included backgrounds, support, learning management, efficiency, excellence, and others as forming a basis for planning and evaluating student skills.

"Scrutinizing Learning Management Systems in Practice: An Applied Time Series Research in Higher Education" by **Tuğtekin** compares two learning management systems. The authors found that found that the dialogue and autonomy factors were significantly higher for the Moodle LMS than for ALMS while other factors showed no significant difference.

Al-Azawei, **Abdullah**, **Mohammed**, and **Abod** investigated students' perceived leadership behaviors of educational leaders in their paper, "Predicting Online Learning Success Based on Learners' Perceptions: The Integration of the Information System Success Model and the Security Triangle Framework." Higher education students in Iraq were surveyed and their constructs were significant predictors of their use of online learning.

The impact of Artificial intelligence on distance education is the subject of "Stakeholder Perspectives on the Ethics of AI in Distance-Based Higher Education" by **Holmes**, **Iniesto**, **Anastopoulou**, and **Boticario.** The authors attempt to understand the ethical concerns of students, teachers, and institutional leaders on AI issues.

In this article, "Instructor Leadership and the Community of Inquiry Framework: Applying Leadership Theory to Higher Education Online Learning" **Meech** and **Koehler** investigated online instructors' perceived leadership behaviors. Applying organizational leadership theory and the Community of Inquiry Framework, the authors investigated the perceptions of both students and instructors. They found that the perceptions of students differed markedly from those of the instructors.

Shah, **Murthy**, and **Iyer**, provide us with a different perspective on MOOCs, in their article, "Is My MOOC Learner-Centric? A Framework for Formative Evaluation of MOOC Pedagogy." The authors conducted expert reviews and internal validation to test the perceived usability and usefulness of their framework in improving pedagogy.

The following article, "How Instructors' TPACK Developed During Emergency Remote Teaching: Evidence From Instructors in Faculties of Education," highlights the technology pedagogical content knowledge as perceived by the instructors engaged in emergency remote teaching interventions. **Çakıroğlu**, **Aydın**, **Kurtoğlu**, and **Cebeci** explain how higher education instructors in Turkey felt about their experiences during the pandemic period. The instructors perceived themselves as having a very high level of knowledge.

In the *Book Notes* section, there are two reviews of open access books by distance education leaders, Martin Weller and Tony Bates. These are followed by three articles in *Notes From the Field*. The first looks at partnerships of higher education institutions with K-12 schools. The second article looks at critical issues in distance education from a Chinese perspective. The last paper consists of observations from the ICDE OER Advisory on the UNESCO OER recommendations.

International **R**eview of **R**esearch in **O**pen and **D**istributed **L**earning
Volume 24, Number 2

May – 2023

Exploring the Influence of Countries' Economic Conditions on Massive Open Online Course (MOOC) Participation: A Study of 3.5 Million MITx Learners

Nergiz Ercil Cagiltay[1], Sacip Toker[2], and Kursat Cagiltay[3]
[1]Atilim University, Software Engineering Department, Incek, Ankara, Turkiye;
[2]Atilim University, Information Systems Engineering Department, Incek, Ankara, Turkiye;
[3]Sabanci University, Faculty of Engineering and Natural Sciences, Istanbul, Turkiye; Azerbaijan State University of Economics (UNEC), The Digital Economy Research Center, Baku, Azerbaijan

Abstract

It is well known that there are disparities in access to education around the world, with developed countries generally having better educational resources and opportunities compared to developing countries. Massive open online courses (MOOCs) have been proposed as a way to bridge this gap by providing free or low-cost online education to anyone with an Internet connection. This study aimed to better understand the effects of location, both country and region, on the use of MOOCs, using data from 3.5 million learners who registered for MOOCs offered by the Massachusetts Institute of Technology (MIT). The data set provided a broad picture of how MOOCs are being used around the globe. The results of the study indicated significant differences in the use of MOOCs among students from different countries and their corresponding economic levels. In order to address these differences and improve access to education through MOOCs, the study suggested several actions that could be taken. These include providing better infrastructure and support for MOOC learners in developing countries, increasing awareness of and access to MOOCs in these regions, and working to improve the quality and relevance of MOOC offerings. Overall, the study highlighted the potential of MOOCs to bridge the educational gap between developed and developing countries, but also emphasized the need for continued efforts to remove barriers and improve access to these resources.

Keywords: massive open online courses, geographic region, country's income level, distance education, online learning

Introduction

The use of massive open online courses (MOOCs) has grown rapidly in recent years, with many universities and other institutions offering a wide range of online courses available to anyone with Internet access. These courses are often free or low-cost, making them an attractive option for learners who may not have access to traditional forms of higher education. The rapid growth of MOOCs in recent years has been driven by a number of factors, including the increasing availability of online education platforms and a growing demand for flexible and affordable forms of higher education. The first MOOCs were offered by a group of Stanford University professors in 2011, and since then the number of MOOCs available has grown rapidly, with more than 900 universities around the world now offering over 59,000 courses. With the impact of the pandemic, at the end of 2021, 220 million students were enrolled in MOOCs (Shah et al., 2022).

However, despite their potential to increase access to education and bridge the gap between developed and developing countries, the use of MOOCs in developing countries has been limited by a number of barriers and challenges (Gameel & Wilkins, 2019; Ma & Lee, 2019; Shcherbinin et al., 2019). MOOCs hold promise for providing quality education to learners in the most deprived parts of the globe. Nevertheless, a large part of the enthusiasm about the possibilities of MOOCs in non-OECD countries has yet to be substantiated. Initial efforts to increase access for the least educated have faced difficulties in the areas of infrastructure, long-term viability, and assessment (Castillo et al., 2015). A common misunderstanding about MOOCs is that because the course materials are accessible for free to users, such platforms have the potential to democratize education across different genders, ethnicities, and economic classes. However, the opportunity cost of not pursuing other activities can still present a major obstacle for students all over the world, even if the course content itself is free (Daniel, 2012).

The term digital divide refers to the unequal access to technology and the Internet among different groups of people, often based on factors such as income, geography, and education level (Rohs & Ganz, 2015). This divide can create barriers to the use of MOOCs, particularly in developing countries where access to technology and the Internet may be limited. These barriers may include a lack of access to reliable Internet and computer technology, low levels of digital literacy among potential learners, and a lack of awareness or understanding of MOOCs in these regions. To overcome these challenges and ensure that MOOCs are accessible to learners in all regions of the world, it will be important to address these barriers and provide the necessary infrastructure and support to enable more people to take advantage of these online courses.

Researchers who have studied the impact of MOOCs in some developing countries have found that these courses have the potential to help reduce the educational gap and increase access to education for individuals who may not have access to traditional forms of higher education. For example, a study of MOOCs in the Sri Lankan higher education context found that these courses could potentially help to reduce the digital divide and promote digital equity in developing countries (Lee et al., 2018). According to the results of one survey, MOOCs provided by the higher education institutions of Sri Lanka offered benefits for professionals as well as students (Warusavitarana et al., 2014). Similarly, by analyzing MOOC usage in Colombia, the Philippines, and South Africa, researchers reported that information and communication technology skills were not a barrier for participating in MOOCs (Garrido et al., 2016). Contrary to these findings, Liyanagunawardena et al. (2013) argued that despite the prevalent notion that MOOCs will extend opportunities and be adopted by learners in developing countries who currently lack direct access to educational opportunities, particularly at advanced levels, the actuality may be that

they will only cater to the privileged in developing countries who already possess access to digital technologies and international language learning.

For example, in China, the usage barrier (a cause of users' resistance to MOOCs), the value barrier (the performance-to-price ratio of MOOCs), and the tradition barrier (resistance as a result of the break with established traditions caused by MOOCs) have been found to be the main barriers to MOOC adoption (Ma & Lee, 2019). Studies provided several insights into the effects of countries' income levels and regions on MOOC usage. For instance, by evaluating the demand for MOOCs using Google Trends for the Organization for Economic Co-operation and Development (OECD) and Baidu Index for China, researchers have reported that (a) demand was affected by higher unemployment, whereas (b) in OECD countries the effective factor was high school level or higher education, and (c) in China it was Internet speed and average income (Tong & Li, 2018). Considering countries' income level, another study reported that online degrees provided by MOOCs are not affordable for students from lower-income countries (Shcherbinin et al., 2019). By considering the performances of learners from French-speaking countries, researchers have reported a gap between learners from European countries and low- and middle-income countries (Chaker & Bachelet, 2020). According to the results from five English and Arabic MOOCs, the region in which learners lived created a significant difference in the essential skills required to be successful in MOOCs (Gameel & Wilkins, 2019).

According to Daniel (2012), the idea that offering non-credit open online courses from the US will solve the challenges of expanding higher education in the developing world is a misconception. In line with this view, El Said (2017) reported that several components of MOOC platforms were designed within the distinct context of the United States. Moreover, there is a danger that MOOCs might increase existing inequalities in education instead of reducing differences (Rohs & Ganz, 2015). MOOC researchers have agreed that to date, there has been insufficient data to conduct a detailed analysis of the socio-cultural conditions of MOOC participants. Additional research is necessary to examine how learners from developing countries can reap advantages from MOOCs, and whether individuals who access certain MOOC content without finishing the course obtain educational and career benefits (El Said, 2017).

Overall, while the economic and digital divide can create challenges for the use of MOOCs in developing countries, these courses also have the potential to help address this divide and increase opportunities for individuals who may not otherwise have access to higher education. However, currently MOOCs are not being accessed by a significant number of less educated individuals in developing countries. Despite the positive and ambitious proclamations of many MOOC providers, these courses have not yet achieved the goal of making education borderless, gender-blind, race-blind, class-blind, and bank account-blind (Christensen et al., 2013). It will be important to continue to address the challenges posed by several factors in order to ensure that MOOCs are accessible to learners in all regions of the world.

Despite the potential advantages of MOOCs for bridging the digital divide and promoting fairness in educational opportunities, the use of MOOCs is still falling behind in developing countries, due to multiple factors such as limited access to technology and the internet, as well as a lack of awareness and resources to support online learning. The people who stand to benefit the most from the MOOC revolution—those who lack access to higher education in developing nations—are not well-represented among the early adopters (Ma & Lee, 2019). As very few studies have provided a deeper understanding of the MOOCs' effects on society by considering the learners' countries, this study aimed to fill this gap

in the literature. Hence, this study explored the impact of income level and geographical region on the use of MOOCs using data from 3.5 million learners who registered for 174 MOOCs offered by MIT.

Material and Methods

This study explored four main research questions:

1. How are MOOC enrollment and course activities distributed in terms of countries' income level?

2. Do the rate of course activities to the number of enrollments differ based on countries' income levels?

3. How are enrollment and course activities distributed by region?

4. Do changes in the rate of course activities to enrollments differ depending on region?

Research Design

Both causal-comparative and descriptive research designs were used in this study. While the causal-comparative research design, one of the quantitative research methodologies, focuses on the causes or effects of existing diversity between or within groups of participants or groups in the sample, the descriptive design examines the current state of a phenomenon, condition, or factor (Fraenkel at al., 2012).

Study Sample

This study examined data from 174 MOOCs offered by the Massachusetts Institute of Technology, with 3,538,295 students enrolled from 225 countries between 2012 and 2016. Criterion sampling was used for this study (Campbell et al., 2020; Palinkas et al., 2015; Shavelson et al., 1985). As a sampling strategy, the researchers initially set criteria to identify the individuals having information on the phenomenon of interest. Because the sample size was large, a data set with the necessary information was created. As a result, the data set was created in a detailed and broadly applicable form. Only data from countries with 600 or more registered students for MITx courses was analyzed, resulting in a final data set of 3,523,692 learners from 204 countries (see Table 1).

Table 1

MITx Registered Students and Their Gender Distributions

Gender	Number	%
Female	734,903	20.86
Male	2,322,594	65.91
Others	12,264	0.35
Not declared	453,931	12.88
Total	3,523,692	100.00

The data was consolidated according to country by considering course activities (namely, viewed, explored, completed, and certified). In the MITx database, if the learner registered in the course, accessed the course main page, and viewed course information such as the syllabus (Ho et al., 2014), the database parameter *viewed* was assigned a value of true. Otherwise, the value was assigned as false. If the learner viewed the course and completed at least half of the course chapters (Ho et al., 2014), the value true was assigned to the database parameter named *explored*. Otherwise, its value was false. If the learner completed the course, the database parameter named *completed* was set to true. Finally, if the learner finished the course and received a certificate, the database parameter *certified* was set to true. If they left the course without getting a certificate, the database parameter certified was set to false.

The country income and region classifications were entered into this consolidated data by using the World Bank country classifications. The World Bank has a list of countries in specific regions. The distribution of countries in the data set of this study was based on these regional classifications is shown in Table 2. As seen from Table 2, according to the World Bank, there are 38 countries in the East Asia and Pacific region, and among them there are learners from 35 countries in the data set of this study. In general, the data set covers 93.58% of the countries in the world. Hence, the data set is very large, covering almost all countries in the world.

Table 2

Frequency Distribution of Countries with MITx Learners (Based on Region)

Region	Number of countries in the region [a]	Number of countries in MITx (*n*)	% [b]	% [c]
East Asia and Pacific	38	35	17.16	92.11
Europe and Central Asia	58	56	27.45	96.55
Latin America and the Caribbean	42	40	19.61	95.24

Middle East and North Africa	21	20	9.80	95.24
North America	3	3	1.47	100.00
South Asia	8	8	3.92	100.00
Sub-Saharan Africa	48	42	20.59	87.50
Total	218	204	100.00	93.58

Note. n = Total number of countries having enrolled students to the MITx. [a] Data from World Bank Open Data portal available at http://data.worldbank.org. [b] Calculated by dividing n by the total number of countries in the study (N = 204).[c] Calculated by dividing n by the total number of countries in each corresponding region.

The World Bank categorizes countries into four economic levels. In order to understand the MITx learners' countries according to this classification, the number of countries in the data set according to this economy level classification is given in Table 3. As seen from this table, the highest number of enrollments were from countries classified as high-income economies (see Table 3, n = 79, 38.73%, income level $12,536 or more).

Table 3

Frequency Distribution of Countries Based on Income Level

Income level	Number of countries in level [a]	Number of countries in MITx (n)	% [b]	Total students
Low	29	25	12.25	22.702
Lower-Middle	50	47	23.04	831.539
Upper-Middle	56	53	25.98	625.181
High	83	79	38.73	2,041,167
Total	218	204	100.00	3,523,692

Note. [a] Data from World Bank Open Data portal (http://data.worldbank.org) [b] Calculated by dividing n by total number of the countries in the present study (N = 204).

Table 4 lists the top 20 countries with the highest number of enrolled learners in the MITx courses; the majority (51%) were from the United States. Among high-income economies, the United States had the most enrolled students (1,798,020), followed by the United Kingdom, Canada, and Germany with 243,410, 219,263, and 166,470 students, respectively.

Table 4

Top 20 Countries According to Number of Students Enrolled in MITx

Country	Number of students	%
United States	1,798,020	51.03
India	1,014,463	28.79
United Kingdom	243,410	6.91
Canada	219,263	6.22
Brazil	214,602	6.09
Germany	166,470	4.72
Spain	153,554	4.36
China	152,038	4.31
Mexico	137,706	3.91
Russian Federation	131,025	3.72
Australia	113,428	3.22
France	108,465	3.08
Pakistan	107,096	3.04
Egypt	103,823	2.95
Colombia	84,810	2.41
Turkey	80,791	2.29
Poland	77,801	2.21
Italy	72,884	2.07
Greece	71,592	2.03
Singapore	71,174	2.02

Data Analysis

To begin, descriptive statistics, including measures of central tendency, were examined. For nominal and interval variables, frequency and percentage information were used; for continuous variables, means and standard deviations were used. For inferential statistics, a MANOVA was employed. In a MANOVA, two or more continuous measures and one or more independent variables on a nominal or interval scale are used to determine whether there is a significant difference between the independent variable categories (Field, 2013).

Before the analyses, the normal distribution of the variables as well as univariate and multivariate outliers were checked. Hence, even though the data were from a huge data set, the shape of the data did not impact the confidence levels for both univariate and multivariate normality (Field, 2013). However, we calculated the skewness and kurtosis of each dependent variable, and found that all these values for four dependent variables were between -1.5 and +1.5, which is accepted as normal distributions (Tabachnick & Fidell, 2007). The normal distribution was not a cause for concern in this data. The univariate outliers in the data were within acceptable proportions of 5%, so the outliers were not removed as Field (2013) suggested since they represented a country. The multivariate outliers were also checked via Cook's distance, and there was no value higher than one, which is the indication of an outlier (Field, 2013). Moreover, the correlations among the dependent variables and the course activities (viewed, explored, completed, and certified) were estimated. The result showed that the course activities were medium level, with significant and positive correlations except for completed and certified (N = 204, $r_{viewed - explored}$ = .528, $p < .01$, $r_{viewed - completed}$ = .519, $p < .01$, $r_{viewed - certified}$ = .534, $r_{explored - completed}$ = .604, $p < .01$, $r_{explored - certified}$ = .616, $p < .01$, $r_{completed - certified}$ = .989, $p < .01$). Since certified courses must first be completed, a high-level correlation was found. On the other hand, since certification required payment, it may be possible to differentiate based on countries' income levels. According to Frane (2015), the correlations to use in MANOVA (or not use) are essentially myths, and no specific link distinguishes MANOVA as particularly potent, independent of effect sizes. Additionally, Frane (2015) claims that MANOVA is used as a protection for multivariate cases as stage 1, and then as stage 2 univariate analysis of each dependent variable with the independent variable should be checked. We follow this suggestion in the present study.

Finally, for MANOVA, we tested the equality of covariance matrices with Box's M, and for follow-up ANOVAs, we tested the equality of variances with Levene's Homogeneity of Variances tests. The corresponding results and remedial processes for these tests are given in the results section.

Results

The results are given below, organized according to each research question.

Distribution of Enrollment and Course Activities by Countries' Income Levels (RQ1)

In Table 5, the sums of enrolled students and course activities are presented by the countries' income levels. The highest percentage of student enrollment was in high-income economies (57.99%); the lowest was in low-income economies (0.64%). Furthermore, the course activities and completion rates within corresponding groups were calculated. The rate of learners' having viewed their course ranged from 60.58% to 63.53%. The rate increased from low-income economies to high-income economies. For the rate or learners who explored their course, high-income economies had the highest (12.01%), and the lower-middle-income economies had the lowest (9.19%). The upper-middle-income and low-income economies were second and third, respectively. Higher-income economies had the highest percentages of students who completed and were certified (4.37% and 4.15%, respectively); lower-middle-income economies had the lowest percentages (2.65% and 2.52%, respectively). The upper-middle-income and lower-income economies had the second and third rates, respectively. It appears that when the number of enrollments and the course activities for viewed, explored, completed, and certified were considered, high-income economies had more access compared to other countries. When the conversion rates (i.e., the process of enrolling in a course and being certified) were examined, high-

income and upper-middle-income economies ranked first and second. Surprisingly, low-income economies ranked third, surpassing lower-middle-income economies. Overall, more than 3.5 million students were enrolled in the MITx system. Among them, 62.89% viewed a course once, and 11.14 of them explored a course. The course completed rate was 3.82%, and the certified ratio was 3.63%, meaning that those who completed a course but did not get a certificate amounted to 0.19% of total students. When income levels were considered, the gap between completed and certified was smallest in lower-middle-income economies and greatest in upper-middle- and higher-income economies.

Table 5

Enrollments and Course Activities by Countries' Income Level

			Activities			
Income level		Total students	Viewed	Explored	Completed	Certified
Low	*n*	22,702	13,754	2,540	719	678
	%	0.64[a]	60.58[b]	11.19[b]	3.17[b]	2.99[b]
Lower-Middle	*n*	831,539	511,434	76,385	22,000	20,989
	%	23.62[a]	61.50[b]	9.19[b]	2.65[b]	2.52[b]
Upper-Middle	*n*	625,181	392,365	68,208	22,620	21,451
	%	17.75[a]	62.76[b]	10.91[b]	3.62[b]	3.43[b]
High	*n*	2,041,767	1,297,187	245,123	89,247	84,686
	%	57.99[a]	63.53[b]	12.01[b]	4.37[b]	4.15[b]
Total	*N*	3,523,692	2,216,193	392,470	134,646	127,858
	%	100.00[a]	62.89[b]	11.14[b]	3.82[b]	3.63[b]

Note. [a] Represents the percentage of the total number of learners. [b] Represents the percentage of the total number of learners in the corresponding category.

Analysis of our first research question showed that high-income economies dominated the total enrollments and differentiated from other countries in course completed and certified rates. Additionally, lower-middle income countries had higher enrollment rates than did upper-middle income countries.

Rate of Course Activities to the Number of Enrollments Based on Countries' Income Levels (RQ2)

A MANOVA was run for this question. According to Box's M test, the equality of covariance matrices assumption was violated, $M = 166.056$, $F_{(30, 43979.454)} = 5.298$, $p < .01$. Since there was more than one variate, Pilliai's Trace was used due to its robustness compared to the other statistics (Field, 2013; Olson, 1979;

Stevens 1980). The result was .178 and significant, $F_{(4, 12)} = 3.134$, $p < .01$, partial $\eta^2 = .059$, indicating that countries' income levels could explain 5.9% of the activities, a small effect.

The rates of course activities significantly differed in terms of income levels among countries. The effect of country income levels on the rate of learners who viewed their MOOC explained 6.1% of the total variance with a significant difference among countries' income levels, $F_{(3, 200)} = 4.296$, $p < .001$, partial $\eta^2 = .061$. The effect of countries' income levels on the rate of learners who explored MOOCs explained 9.0% of the total variance with a significant difference among countries' income levels, $F_{(3, 200)} = 6.586$, $p < .001$, partial $\eta^2 = .090$. For rates of completed and certified, the values were 14.5% and 15.3%, respectively, with a significant difference among countries' income levels, $F_{(3, 200)} = 11.336$, $p < .001$, partial $\eta^2 = .145$, and $F_{(3, 200)} = 12.032$, $p < .001$, partial $\eta^2 = .153$. These results indicated that the difference in income levels among countries was more viable when completed and certified course activities were considered.

To reveal which category of income level caused a significant difference, the Scheffe test, a post-hoc test used when the homogeneity of variances has not been violated, was performed for all course activities viewed [F(3, 200) = .481, p = .696], explored [F(3, 200) = .467, p = .900], completed [F(3, 200) = 2.199, p = .089], and certified [F(3, 200) = 2.665, p = .50]. The difference in the course activity of learners having viewed their MOOC was due to the difference between lower-middle income economies and high-income economies (p <.01). In other activities, high-income economies outperformed both lower-middle and upper-middle-income economies (p <.05). Analysis of our second research question revealed that learners' course activities were influenced by their countries' income levels, but with a small effect size. The reason for this disparity in all course activities was that high-income economies had higher rates than did other countries.

Distribution of Enrollment and Course Activities by Region (RQ3)

Although there were only three countries in the North America region (the United States, Canada, and Bermuda), about 30% of students enrolled in MITx were from there (Table 6). The second highest enrollment came from Europe and Central Asia (17.26%). The Sub- Saharan Africa region had the lowest enrollment rate (2.58%). Learners from Europe and Central Asia had the highest rate of having viewed their MOOC (65.06%). Since the data set was very large, all the details of countries cannot be shown in this study. However, some examples from the data set served to highlight the key differences. For instance, the rate for viewed courses was 76.34% in Greenland, 64.91% in Switzerland, and 64.26% in the Netherlands. Learners in the Middle East and North Africa were least likely to have viewed courses (59.07%); for example, rates were 50% in Yemen, 52.91% in Iran, and 52.95% in Bahrain. In terms of having explored courses, Europe and Central Asia had the highest rate (13.41%), including, for instance, Monaco (41.49%), Greenland (26.78%), and Spain (17.44%). The explored rate was lowest (8.59%) in the Middle East and North Africa, including Yemen (4.42%), Tunisia (7.65%), and Egypt (8.69%). Regarding completed and certified course activities, once again, Europe and Central Asia had the highest rates at 5.32% and 5.04%, respectively. To illustrate, rates of certification were 13.13% in Monaco, 10.75% in Greenland, and 6.77% in Spain. On the other hand, completed and certified course activity rates were lowest in the Middle East and North Africa, at 2.03% and 1.93%, respectively. For instance, the certified rates were 0.59% in Libya, 0.94% in Yemen, and 1.47% in Iraq.

Table 6

MITx Enrollment and Course Activities by Region

Region	Total students		Viewed		Explored		Completed		Certified	
	n	%	*n*	%	*n*	%	*n*	%	*n*	%
East Asia and Pacific	390,126	11.08[a]	244,712	62.73[b]	42,497	10.89[b]	13,115	3.36[b]	12,319	3.16[b]
Europe and Central Asia	853,042	24.23[a]	554,949	65.06[b]	114,376	13.41[b]	45,401	5.32[b]	42,972	5.04[b]
Latin America and the Caribbean	364,543	10.35[a]	229,650	63.00[b]	41,328	11.34[b]	13,519	3.71[b]	12,773	3.50[b]
Middle East and North Africa	153,301	4.35[a]	90,562	59.07[b]	13,167	8.59[b]	3,116	2.03[b]	2,960	1.93[b]
North America	1,061,452	30.14[a]	663,588	62.52[b]	115,481	10.88[b]	40,653	3.83[b]	38,813	3.66[b]
South Asia	607,856	17.26[a]	376,812	61.99[b]	55,774	9.18[b]	16,286	2.68[b]	15,610	2.57[b]
Sub-Saharan Africa	90,869	2.58[a]	54,467	59.94[b]	9,633	10.60[b]	2,496	2.75[b]	2,357	2.59[b]
Total	3,521,189	100.00[a]	2,214,740	62.90[b]	392,256	11.14[b]	134,586	3.82[b]	12,7804	3.63[b]

Note. [a] Represents the percentage of the total number of learners. [b] Represents the percentage of the total number of learners in the corresponding category.

Analysis of our third research question led us to conclude that North American countries had highest rates of courses viewed while European and Central Asian countries had greater rates of courses explored, completed, and certified. Overall, countries in Western regions led the rates in terms of course activities.

How Changes in the Rate of Course Activities to Enrollments Differ Depending on Region (RQ4)

A MANOVA was run for this question. According to Box's M test, the equality of covariance matrices assumption was violated, M = 284.913, F(50, 6085.359) = 5.181, p < .01. Since there was more than one variate, Pilliai's Trace was used as it is more robust compared to other statistics (Field, 2013; Olson, 1979; Stevens, 1980). The result was .353 and statistically significant, F(24, 788) = 3.178, p < .01, partial η2 = .088. The rates of course activities differed significantly in terms of countries' income levels. The impact of countries' regions on the rate of the viewed course activity explained 15.5% of the total variance with a significant difference among regions, F(6, 197) = 6.043, p < .001, partial η2 = .155. The value for the explored course activity was close to 15.1% with a significant difference among regions, F(6, 197) = 5.856, p < .001, partial η2 = .151. For the completed and certified course activities, results were 27.7% and 28.3%, respectively, with a significant differences among regions, F(6, 197) = 12.560, p < .001, partial η2 = .277, and F(6, 197) = 12.988, p < .001, partial η2 = .283. These values indicated that the gaps among regions were more viable when completed and certified course activities were considered.

To determine which regions caused the significant difference, the Dunnett C test, a post-hoc test used when the homogeneity of variances has been violated, was performed for completed course activities, [F(6, 197) = 2.487, p < .05], and the Scheffe test, a post-hoc test used when the homogeneity of variances was not violated, were performed for viewed [F(6, 197) = 1.427, p = .206], explored [F(6, 197) = 1.325, p = .248], and certified [F(6, 197) = 2.059, p = .060] course activities. In terms of the viewed activity, Europe and Central Asia had significantly higher rates than did East Asia and the Pacific, Latin America and the Caribbean, the Middle East and North Africa, and Sub-Saharan Africa. Regarding the explored activity, Europe and Central Asia demonstrated significantly higher rates than did East Asia and the Pacific, South Asia, the Middle East and North Africa, and Sub-Saharan Africa regions. For the completed and certified activities, Europe and Central Asia demonstrated significantly higher rates than did East Asia and the Pacific, South Asia, Latin America and the Caribbean, the Middle East and North Africa, and Sub-Saharan Africa regions. Analysis of our third research question revealed that countries in Europe and Central Asia outperformed the majority of countries in other regions in all course activities. Moreover, it can be inferred that countries in Europe and Central Asia had more certified course activity compared to other regions. From courses viewed to courses certified, the size of the effect of the difference between Europe and Central Asia compared to other regions increased.

Discussion

The results of this study showed important differences among the learner behaviors of different countries when considering country regions and income levels. The results indicated that for the countries with high-income economies, the percentage of student enrollment and rate of viewed, explored, completed, and certified course activities were higher compared to the countries with lower-income economies. In support of the findings of the present study, average income was also found to be among the factors that shaped MOOC demand in developing countries (Shcherbinin et al., 2019; Tong & Li, 2018). Our results aligned with Lee et al. (2018) who suggested that although MOOCs are available ubiquitously for everybody, their promise of minimizing the educational gap as well as increasing access and digital equity in developing countries has not been fully enabled. As Dell'Acqua (2014) noted, access to MOOCs has been constrained while MOOCs themselves are inherently rich and diverse opportunities

for education. Unfortunately, the present research confirmed the concerns related to MOOCs and their impact on the digital divide, as argued previously by Gameel and Wilkins (2019).

When conversion rates (the process of enrolling in a course and being certified) were examined in the present study, high-income and upper-middle-income economies were ranked first and second. Surprisingly, low-income economies ranked third, surpassing lower-middle-income economies. The gap between completed and certified was lowest in lower-middle-income economies; however, it was highest in upper-middle- and higher-income economies.

The regional data can be interpreted in two ways: (a) as the rate of countries using MOOCs in their respective regions, and (b) as each region's rate among other regions. Regarding the former, the current study found that all countries in North America and South Asia used MOOCs (see Table 2, 100%). This rate was around 95% in Latin America and the Caribbean, Europe and Central Asia, and the Middle East and North Africa. In Sub-Saharan Africa, this rate decreased to 87.5%. With the latter interpretation, the results showed that Europe and Central Asia had the highest rates of completed and certified activities between 2013 and 2016, while rates were lowest in Sub-Saharan Africa. The results also showed that these rates were significantly higher in Europe and Central Asia than in the East Asia and the Pacific, South Asia, Latin America and the Caribbean, Middle East and North Africa, and Sub-Saharan Africa regions. Similarly, the rates for the viewed activity were significantly higher in Europe and Central Asia than in East Asia and the Pacific, Latin America and the Caribbean, the Middle East and North Africa, and Sub-Saharan Africa. The rates for explored were also significantly higher in Europe and Central Asia than in the East Asia and Pacific, South Asia, the Middle East and North Africa, and Sub-Saharan Africa. One possible explanation for these regional differences may be related to the Internet and other such infrastructure issues due to geography. Significant differences have been reported among learners from different regions (Gameel & Wilkins, 2019).

Learners' education levels may be another factor causing this difference among different countries and regions. Earlier studies have shown that most MOOC learners are well educated (Cagiltay et al., 2013) and the number of well-educated people is lower in developing countries compared to developed countries. Language may be another barrier. For example, according to Aboshady et al. (2015) language was not recognized as a barrier to MOOCs in Egypt. However, since most MOOCs are in English, students speaking a variety of languages in a single class could cause problems, and MOOCs need to be organized with an understanding of these problems (Tahirsylaj et al., 2018). Additionally, as reported by an earlier study, there could be other barriers, such as learners from less-developed countries feeling uncomfortable in the learning environment (Kizilcec et al., 2017).

The context of the MOOC may create distress among learners and negatively impact enrollment rates (Essex & Cagiltay, 2001). One contextual issue is related to the proposed course topic itself, as learners may be more interested in some topic areas than others. Since the MITx courses were developed in the US mainly for the needs of that audience, this may have an impact on enrollment rates (Daniel, 2012). Another important contextual issue is the reputation of the institution, MIT, offering the courses. People from low-income countries are attracted by the institution. However, the teaching methods and expectations in MITx MOOCs may have differed from what some learners in low-income countries were used to (El Said, 2017). Even though we have no data to support this inference, it should be considered for exploration in future studies. Closely related is the issue of limited access to technology which may also hamper learners' ability to get into courses as well as complete assignments or assessments required for completing the course. Finally, contextual factors such as course length, difficulty level,

and availability of resources (such as textbooks or supplementary materials) can also influence enrollment. Developing mechanisms to provide support and guidance to learners from low-income countries may help to increase course completion rates. Recent developments in artificial intelligence technologies (e.g., ChatGPT by OpenAI) may play an important role in overcoming some of the reported challenges.

These results indicated that living in a high-income or Western region country positively influenced completed and certified activities in the MITx courses. An earlier study attributed this to the fact that the vast majority of the students are from high-income countries and the courses follow these students' interests, which in turn increases their motivation in the courses (Shcherbinin et al., 2019). As these courses can be reached from all over the world, it is not possible to address regional motivations and requirements in a single MOOC. Local universities may be encouraged to collaborate with the major MOOC providers and develop MOOC solutions by considering the specific motivations and requirements of their region.

Conclusion

Based on analysis of more than 3.5 million learners in MITx courses, this study provided recommendations for improving MOOCs. Several suggestions applied to MOOC providers, such as offering more introductory-level courses on specific topics, providing free certification for these courses to eliminate economic barriers for learners from developing countries, and adapting MOOCs to the local context to better meet the needs of learners in different regions.

This study reported significant differences among MITx learners from different parts of the world. A range of factors, such as geographical effects, education levels, language, as well as cultural and psychological factors, could be key influences. Such differences may improve access to education in these regions through more tailored, local support for learners in developing countries. Supportive of our results, an earlier study also reported some cultural differences in patterns of acceptance behaviors between Turkish and Malaysian engineering students (Arpaci et al., 2020).

MOOC providers may also choose to develop localized pricing strategies like those at Netflix, for example. In addition, local universities may collaborate with major MOOC providers and develop MOOC solutions by considering the specific motivations and requirements of their region. For instance, an earlier study reported that learners' performance was influenced by their online listening responses in course forums (Du et al., 2022), for which the course language can be a barrier. Hence, an adoption strategy for each country may be developed in collaboration with local universities and MOOC providers. In order to improve these adoption processes, global entities such as the United Nations Development Programme and United Nations Educational, Scientific and Cultural Organization may also provide additional support.

Acknowledgements

We are grateful to MITx for allowing us to obtain the MOOC data.

References

Aboshady, O. A., Radwan, A. E., Eltaweel, A. R., Azzam, A., Aboelnaga, A. A., Hashem, H. A., Darwish, S. Y., Salah, R., Kotb, O. N., Afifi, A. M., Noaman, A. M., Salem, D. S., & Hassouna, A. (2015). Perception and use of massive open online courses among medical students in a developing country: Multicentre cross-sectional study. *BMJ Open, 5*(1). https://doi.org/10.1136/bmjopen-2014-006804

Arpaci, I., Al-Emran, M., & Al-Sharafi, M. A. (2020). The impact of knowledge management practices on the acceptance of massive open online courses (MOOCs) by engineering students: A cross-cultural comparison. *Telematics and Informatics, 54*. https://doi.org/10.1016/j.tele.2020.101468

Cagiltay, N. E., Cagiltay, K., & Celik, B. (2020). An analysis of course characteristics, learner characteristics, and certification rates in MITx MOOCs. *International Review of Research in Open and Distributed Learning, 21*(3), 121–136. https://doi.org/10.19173/irrodl.v21i3.4698

Campbell, S., Greenwood, M., Prior, S., Shearer, T., Walkem, K., Young, S., Bywaters, D., & Walker, K. (2020). Purposive sampling: complex or simple? Research case examples. *Journal of Research in Nursing, 25*(8), 652–661. https://doi.org/10.1177/1744987120927206

Castillo, N. M., Lee, J., Zahra, F. T., & Wagner, D. A. (2015). MOOCs for development: trends, challenges, and opportunities. *Information Technologies and International Development, 11*(2).

Chaker, R., & Bachelet, R. (2020). Internationalizing professional development: Using educational data mining to analyze learners' performance and dropouts in a French MOOC. *The International Review of Research in Open and Distributed Learning, 21*(4), 199–221. https://doi.org/10.19173/irrodl.v21i4.4787

Christensen, G., Steinmetz, A., Alcorn, B., Bennett, A., Woods, D., & Emanuel, E. (2013). The MOOC phenomenon: Who takes massive open online courses and why? SSRN. http://dx.doi.org/10.2139/ssrn.2350964

Daniel, J. (2012). Making sense of MOOCs: Musings in a maze of myth, paradox and possibility. *Journal of Interactive Media in Education, 3*(18). https://doi.org/10.5334/2012-18

Dell'Acqua, S. (2014). Massive open online courses (MOOCs): Is it real democracy? *European Journal of Educational Sciences, 1*(2). https://doi.org/10.19044/ejes.v1no2a4

Du, Z., Wang, F., Wang, S., & Xiao, X. (2022). Online listening responses and e-learning performance. *Information Technology & People*. (Early Access). https://doi.org/10.1108/ITP-09-2021-0687

El Said, G. R. (2017). Understanding how learners use massive open online courses and why they drop out: Thematic analysis of an interview study in a developing country. *Journal of Educational Computing Research, 55*(5), 724–752. https://doi.org/10.1177/0735633116681302

Emanuel, E. J. (2013). MOOCs taken by educated few. *Nature, 503*, 342–342. https://doi.org/10.1038/503342a

Essex, C., & Cagiltay, K. (2001). Evaluating an online course: Feedback from "distressed" students. *Quarterly Review of Distance Education, 2*(3), 233–239.

Field, A. (2013). *Discovering statistics using IBM SPSS statistics*. Sage Publications.

Fraenkel, J. R., Wallen, N. E., &Hyun, H. H. (2012). *How to design and evaluate research in education* (Vol. 7). McGraw-Hill.

Frane, A. V. (2015). Power and type I error control for univariate comparisons in multivariate two-group designs. *Multivariate Behavioral Research, 50*(2), 233–247. https://doi.org/10.1080/00273171.2014.968836

Gameel, B. G., & Wilkins, K. G. (2019). When it comes to MOOCs, where you are from makes a difference. *Computers and Education, 136*, 49–60. https://doi.org/10.1016/j.compedu.2019.02.014

Garrido, M., Koepke, L., Anderson, S., & Mena, A. F. (2016). The Advancing MOOCs for Development Initiative: An examination of MOOC usage for professional workforce development outcomes in Colombia, the Philippines, & South Africa (TASCHA Report). Seattle: University of Washington Information School. Retrieved from https://digital.lib.washington.edu/researchworks/bitstream/handle/1773/35647/Advancing_MOOCs_for_Development_Final_Report_2016_Final.pdf

Ho, A. D., Reich, J., Nesterko, S. O., Seaton, D. T., Mullaney, T., Waldo, J., & Chuang, I. (2014). HarvardX and MITx: The first year of open online courses, Fall 2012–Summer 2013. SSRN. https://doi.org/10.2139/ssrn.2381263

Kizilcec, R. F., Saltarelli, A. J., Reich, J., & Cohen, G. L. (2017). Closing global achievement gaps in MOOCs. *Science, 355*(6322), 251–252. https://doi.org/10.1126/science.aag2063

Lee, J., Hong, A., & Hwang, J. (2018). *A review of massive open online courses : MOOC's approach to bridge the digital divide*. 22nd Biennial Conference of the International Telecommunications Society, Seoul, South Korea.

Liyanagunawardena, T. R., Adams, A. A., & Williams, S. (2013). MOOCs: A systematic study of the published literature 2008–2012. *International Review of Research in Open and Distributed Learning, 14*(3), 202–227. https://doi.org/10.19173/irrodl.v14i3.1455

Ma, L., & Lee, C. S. (2019). Understanding the barriers to the use of MOOCs in a developing country: An innovation resistance perspective. *Journal of Educational Computing Research, 57*(3). https://doi.org/10.1177/0735633118757732

Olson, C. L. (1979). Practical considerations in choosing a MANOVA test statistic: A rejoinder to Stevens. *Psychological Bulletin, 86*(5), 1350–1352. https://doi.org/10.1037/0033-2909.86.6.1350

Palinkas, L. A., Horwitz, S. M., Green, C. A., Wisdom, J. P., Duan, N., & Hoagwood, K. (2015). Purposeful sampling for qualitative data collection and analysis in mixed method implementation research. *Administration and Policy in Mental Health and Mental Health Services Research, 42*, 533–544. http://dx.doi.org/10.1007/s10488-013-0528-y

Rohs, M., & Ganz, M. (2015). MOOCs and the claim of education for all: A disillusion by empirical data. *International Review of Research in Open and Distributed Learning, 16*(6). https://doi.org/10.19173/irrodl.v16i6.2033

Shah, D., Pickard, L., & Ma, R. (2022). Massive list of MOOC platforms around the world in 2023. https://www.classcentral.com/report/mooc-platforms/

Shavelson, R. J., Brophy, M., & Obemeata, J. O. (1985). *Evaluation of nonformal education programs: The applicability and utility of the criterion-sampling approach*. UNESCO Institute for Education.

Shcherbinin, M., Kruchinin, S. V., & Ivanov, A. G. (2019). MOOC and MOOC degrees: new learning paradigm and its specifics. *International Transaction Journal of Engineering, Management, & Applied Sciences & Technologies*, 10, 1-14. https://tuengr.com/V10A/10A19K.pdf

Stevens, J. P. (1980). Power of the multivariate analysis of variance tests. *Psychological Bulletin, 88*(3), 728–737. https://doi.org/10.1037/0033-2909.88.3.728

Tabachnick, B. G., & Fidell, L. S. (2007). *Using Multivariate Statistics* (5th ed.). Pearson Education.

Tahirsylaj, A., Mann, B., & Matson, J. (2018). Teaching creativity at scale: Overcoming language barriers in a MOOC. *International Journal of Innovation, Creativity and Change*, *4*(2), 1-9.

Tong, T., & Li, H. (2018). Demand for MOOC: An application of big data. *China Economic Review, 51*, 194–207. https://doi.org/10.1016/j.chieco.2017.05.007

Warusavitarana, P. A., Lokuge Dona, K., Piyathilake, H. C., Epitawela, D. D., & Edirisinghe, M. U. (2014). MOOC: A higher education game changer in developing countries. In B. Hegarty, J. McDonald, & S.-K. Loke (Eds.), *Rhetoric and reality: Critical perspectives on educational technology. Proceedings ascilite Dunedin 2014* (pp. 359-366). https://www.ascilite.org/conferences/dunedin2014/files/fullpapers/321-Warusavitarana.pdf

International **R**eview of **R**esearch in **O**pen and **D**istributed **L**earning
Volume 24, Number 2

May – 2023

Informal Practices of Localizing Open Educational Resources in Ghana

Emily Durham Bradshaw and Jason K. McDonald
Brigham Young University

Abstract

Research on the use of open educational resources (OER) has often noted the potential benefits for users to revise, reuse, and remix OER to localize it for specific learners. However, a gap in the literature exists in terms of research that explores how this localization occurs in practice. This is a significant gap, given the current flow of OER from higher-income countries in the Global North to lower-income countries in the Global South. This study explored how OER from one area of the world was localized when used in a different cultural context. Interviews from six facilitators of an OER human rights course in Ghana showed that without initial awareness of OER, localization happened largely informally. Practices included (a) technological workarounds and persistence; (b) spontaneous language translation; (c) cultural recontextualization through spontaneous adjustment, content substitutions, and discussion; and (d) social responsiveness. We found implications for designers to anticipate challenges related to dependence on technology, intentionally leave space for informal localization, and allow for linguistic flexibility.

Keywords: localization, open educational resources, Ghana

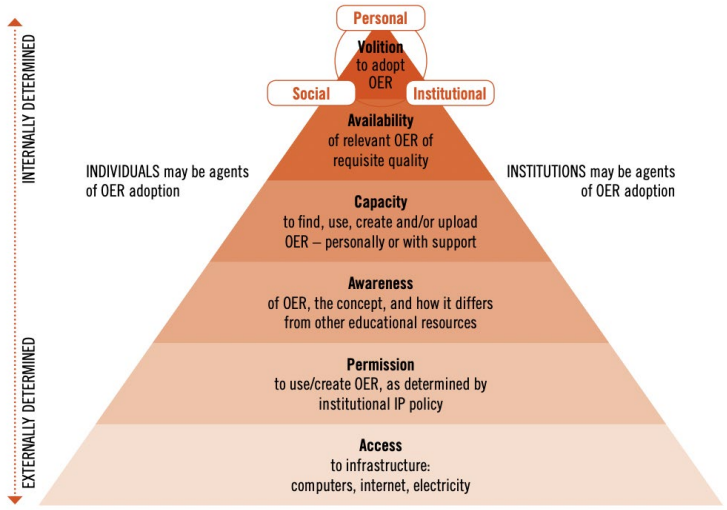
Introduction

Over the past 20 years, research on open educational resources (OER) has touted the promise of OER to open the so-called lockbox of education with its potential to provide access to education for all people, everywhere (William and Flora Hewlett Foundation, 2013). While researchers have uncovered valuable insights concerning the development and use of OER (Cox & Trotter, 2017; Creative Commons, n.d.; Prinsloo & Roberts, 2022; Wiley. & Hilton, 2018) many questions remain unexplored as to how OER has been used in different global contexts. It is of particular importance that most research has focused on OER use in the Global North, but preliminary evidence suggests patterns of use have been different in the Global South. Recent studies have shown that in the Global South, most OER content has been used as is, or possibly translated into local languages. Fewer OER users were likely to engage in practices such as remixing or reusing for reasons including lack of bandwidth, language differences, or cultural mismatches (de los Arcos & Weller, 2018; de Oliveira Neto et al., 2017).

Cox and Trotter (2017, p. 301) presented a framework that detailed several factors impacting adoption of OER in South Africa; these factors varied regarding level of individual control (Figure 1).

Figure 1

OER Adoption Pyramid



Note. From "Factors shaping lecturers' adoption of OER at three South African universities," by G. Cox and H. Trotter, in C. Hodgkinson-Williams and P. B. Arinto (Eds.), *Adoption and impact of OER in the Global South* (pp. 287–347), 2017, International Development Research Centre and Research on Open Educational Resources for Development (https://doi.org/10.5281/zenodo.601935). Copyright 2017 by International Development Research Centre and Research on Open Educational Resources for Development. Reprinted with permission.

This framework illustrates that OER use, which would be located in the capacity section of the pyramid, is dependent on contextual factors out of the control of the OER user. Without access or awareness, for example, people's use of OER is inhibited. While our study did not specifically address OER adoption, it

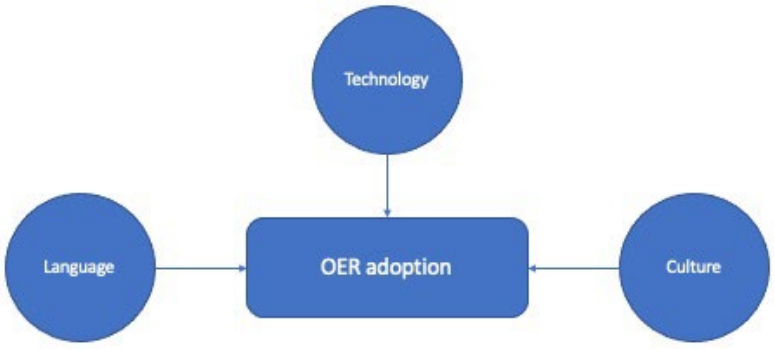
supported this model in that the practice of localization was greatly impacted by technological, linguistic, and cultural factors; these parts of the pyramid lead toward adoption. We further illuminated the practice of localization within a specific context, exploring the lived experiences of facilitators of a human rights course in Ghana as they localized content despite these barriers. We found that they used informal, in-the-moment practices to recontextualize content created in the United States for their learners. We explored these issues through semi-structured interviews with facilitators who developed an account of their informal localization practices and how those practices facilitated their use of OER materials.

Literature Review

In the Global North, discussion on use of OER has centered on student use of the 5Rs (retain, reuse, revise, remix, and redistribute) in completing more creative assignments (Clinton-Lisell, 2021; DeRosa, 2016; Kimmons, 2016). However, different patterns of use may exist in the Global South, and a limited view of what constitutes OER use or how that is researched may have relied too heavily on assumptions based on students from higher income countries, their technology access, and their language use. A recent study of 7,700 faculty members in the Global South showed patterns of OER use around the world, indicating that faculty in the Global South were more likely to adapt OER content (usually through translation), but due to Internet connectivity and available data for uploading, less likely to share content than were faculty in the Global North (de los Arcos & Weller, 2018). These different patterns were based on different contextual factors (Prinsloo & Roberts, 2022) and barriers to the use of OER. Research on these factors has tended to align with a framework encompassing the areas of technology, language, and cultural contextualization (Figure 2).

Figure 2

Factors Influencing OER Adoption



Technology

Limited access to technology limits users' access to OER. "Internet user statistics in 2016 revealed penetration rates of 28.7% in Africa and 45.6% in Asia were below the world average of 50.1%, and well behind Europe (73.9%) and North America (89%)" (de los Arcos & Weller, 2018, p. 151). The reality of inconsistent power supply (Omoike, 2021), dilapidated tools, and the resulting lack of familiarity with technological tools among educators (Ezumah, 2020) suggest significant barriers to accessing and using OER in some parts of the Global South. Furthermore, these connectivity issues reinforce a top-down structure in which people from the Global North are the OER producers and those from the Global South are the OER consumers. Those with inadequate Internet connectivity are not as likely to upload and share content.

Language

A key barrier to OER use is related to language access; research has shown significantly more production of OER in English (Cobo, 2013). Given this, those who use these OER must have some level of English or elite language proficiency (Aramide & Elaturoti, 2021) or must rely on translation (Amiel 2013). As most users of OER in the Global South use them as is, and only 23% of users create OER (de Oliveira Neto et al., 2017), the lack of availability of OER in many languages significantly limits users' access to OER in local languages. Furthermore, when technologies do not support multilingual interfaces, the remixing and creation of OER is limited for those in the Global South due to lack of linguistically flexible technological tools (West & Victor, 2011). Despite barriers to use of OER due to linguistic inflexibility, there have been recommendations for linguistic diversity in the production of OER from international groups (United Nations Educational, Scientific and Cultural organization [UNESCO], 2012). Additionally, case studies into multilingual OER production have begun to emerge (Oates & Hashimi, 2016).

In one study of OER localization in Nepal, parents rejected translation of OER in local languages, wanting their children to rise above and beyond local practices (and languages) to be citizens of the global world (Raj et al., 2019). In this case, true localization occurred when local people had control over what and how they learned, including the language in which content was presented.

Cultural Recontextualization

In many accounts from the literature on localization, OER that travels from the North to the South may be culturally mismatched, even after linguistic translation. For instance, researchers have suggested that OER available in Nigeria is not adapted for local audiences (Adeyeye & Mason, 2020; Aramide & Elaturoti, 2021). A systematic review of research into the use of MOOCs and OER in the Global South identified inflexibility and decontextualization related to wholesale adoption of OER materials (King et al., 2018).

Some researchers have observed cultural recontextualization taking place through localization in specific settings. In Amiel's (2013) study of how OER is reused, he concluded that localization is an automatic practice, because whenever OER moves from the hands of one source to another, a new user will recontextualize it. Wolfenden and Adinolfi (2019) reported that this type of cultural recontextualization "involves drawing on the lived contexts and practices of teachers, learners, families and communities within their textual content and through the activities in which they are deployed" (p. 330). Three Nepalese

localizers from the Ivins (2011) study stressed the importance of contextualization being done by locals and added the benefit of community ownership developing as part of a participatory practice.

Despite the insights of these findings, more research is needed to understand how OER is localized and how decisions about localization are made in different parts of the world. In our study, the research question asked: what practices of facilitators localizing OER recontextualized it for learners in Ghana?

Method

We conducted a qualitative study of the experiences of educators localizing OER in Ghana, using in-depth, semi-structured interviews. Our focus was on educators' practices themselves, not their beliefs about, or knowledge of, OER as a construct. Thus, we took a practice-oriented approach to our research, grounding our assumptions about those we interviewed and their practical involvement in the world as found in the writings of Dunne (1997) and Packer (2018). In this perspective:

> humans are fully embodied, engaged agents . . . situated in a lived world of significance [which allows for theorizing into human activity that does not] invoke a more fundamental reality of causal forces assumed to control . . . human participation. (Yanchar & Slife, 2017, pp. 147–148)

Research Context

This research grew out of work completed by an non-governmental organization (NGO) based in the United States, connecting people in low-bandwidth areas of the globe with educational resources. One of the first courses piloted in these gathering centers was a human rights course entitled *Human Dignity*, co-authored by this paper's first author in cooperation with the Geneva Office for Human Rights Education. Volunteer facilitators generally took turns organizing discussions, adapting materials for local needs, and supporting participants in the class. The course was licensed using a Creative Commons CC-BY license. Due to costs in time and travel, gatherings were mostly held via Zoom.

Participants

The participants in this study were purposefully selected from available course facilitators at local community gathering centers in various cities in Kumasi, Accra, and Assin Foso, Ghana (Table 1). All of the participants used the same curriculum, and they had enough experience with the content to comment on localization.

Table 1

Participant Backgrounds, Interests, and Group Dynamics

Participants*	Background and interests	Group dynamics
Beth	Nurse. Volunteer teacher of the weekly course.	Over 30 participants; Beth was the only teacher.
Kate	Construction manager. Student at a local university. Led a project to create a localized manual.	Group of eight with rotating teaching.
John	Student in applied technology.	Group of five with rotating teaching.
Randall	Not from Ghana but has lived there over 10 years. Former member of John's group.	Group of five with rotating teaching.
Rebecca	Master's student at a local university.	Group of eight with rotating teaching.
Tobias	Working toward university education. Learning to be a mechanic and teaching professional driving.	Group of eight with rotating teaching.

**Note*. Participant names are by pseudonym.

Data Collection

To document the experiences of facilitators who localized content, the first author of this aper conducted two, 45-minute interviews with four participants, and, due to time constraints, a single 45-minute interview with the remaining two participants. Questions focused on what changes facilitators made to OER content. Due to the geographical separation between the participants and interviewer, interviews were conducted and recorded over Zoom. Interviews were initially transcribed using the Zoom transcription feature, and later edited for accuracy by the first author.

Data Analysis

Data analysis was conducted using steps outlined by Churchill (2022). First, each interview was read to provide researchers with a sense of the whole and to generate possible overarching themes that reflected major patterns in the data. Second, interviews were then read closely, with detailed themes being identified that summarized aspects of participants' practices at the phrase, sentence, or paragraph level. Third, a comprehensive synthesis was undertaken, where initial themes were grouped into an initial structure. Fourth, the structure was clarified by comparing themes for opportunities to combine, break into smaller units, eliminate, or otherwise refine them. The intent was to develop an account of our participants' comments that accurately reflected the experiences they described. Throughout this process, more granular themes were compared to the whole corpus of data. Themes generated from the whole were compared to

the line-by-line readings to check that the emerging structure reflected the details participants shared and patterns evident across interviews (Fleming et al., 2003).

Trustworthiness and Rigor

To help ensure trustworthiness and rigor, we conducted a member check towards the end of the research process. This took place by sending participants a summary version of our analysis and asking if they thought it adequately represented what they said, as well as asking if anything else should be added so their experiences were related in an accurate manner. All participants responded that the themes were in line with their intended meanings and no adjustments were requested.

Limitations

Like all research, this study had limitations. Our qualitative method did not allow for generalizability to larger samples, so we do not to report findings as if they were generalizable to all groups. Also, our own position as researchers from another country than our participants affected our understanding. While we believe our member checking helped address this, we are sensitive to this issue. We hope future research conducted by cultural insiders can reveal additional insights that our report could not provide.

Findings

The facilitators we interviewed described how they localized content in informal ways. Many of these practices aligned with the framework presented earlier (see Figure 1) and were used as major themes to report our findings: (a) technology, (b) language, and (c) cultural recontextualization. Additionally, facilitator practices suggested a fourth theme, (d) social responsiveness based on relationships (Table 2).

Table 2

Informal Localization Practices

Type of adjustment	Description of localization practices
Technology	Creating workarounds for poor technology. Technology challenges included poor Internet connection, insufficient data, broken hardware. Students persisted and found workarounds.
Language	Translation happened spontaneously in response to student needs. With multiple languages used by locals, facilitators moved between languages seamlessly and based on the contours of the immediate conversation. Building literacy. Some facilitators used the OER to help build literacy, a kind of localization not anticipated by the OER designers.
Cultural recontextualization	Spontaneous adjustments occurred in the moment of teaching.

	Some content switches happened in a moment of teacher inspiration. Discussion was the means for naturally adding local spice. Even if teachers went through the manual as written, learners' personal responses to discussion questions added content relevance.
Social responsiveness	Developed relationships with students to teach responsively. Facilitators based plans and adjustments on helping students understand and feel accepted.

Technology

All but one of the facilitators experienced problems with technology that led to them localizing the OER to work around these problems. For instance, issues with the Zoom platform often proved frustrating. Tobias shared, "Zoom was not working . . . I am trying to connect and connect and connect and connect [to the Internet]. I was like, forget about Zoom, so I thought I would send you a WhatsApp link." While this change allowed Tobias to communicate with his group, since the WhatsApp interface was different from Zoom it also meant he had to adjust how he used the OER content.

Rebecca's experience was similarly riddled with technological problems. She had adjusted the class to be offered online because of "transport issues, money, and even the time for the meeting wasn't really favorable for us to meet. . . . Online was convenient for most of us because . . . as long as you had a digital device like a phone or a laptop, you could still join." This choice led her to adjust in-person activities (e.g., the human knot game) into activities appropriate for the online setting. However, this localization invited other technological problems. "Internet connection at this part of our area is really poor. Some people live in very rural areas. In those places there are no Internet connections. Even if you have, it is very low." Rebecca's descriptions of frequent delays, disconnections, people dropping off, and people not joining because of lack of connection showed how technology called for the development of localized solutions to work around technology problems, and even then, remained a persistent inconvenience for the group.

Language

Translation Happened Spontaneously in Response to Student Needs

One of the main ways the facilitators revised OER was through translation; however, translation occurred informally in conversation, as facilitators navigated the practical need for students to speak English as a common language but also to understand the concepts in their local language, Twi. While it seemed like much of the work of the class involved translation, it happened seamlessly, and none of the facilitators mentioned this aspect of localization until they were specifically asked about it. When asked what language they used in class, Kate explained:

> We mostly used English. We just used English because . . . there was no reason. We sometimes used Twi. English is our official language. When people really wanted to express themselves, they would

> use Twi. If they are explaining something and we are not getting it, they would switch the language and explain it in Twi.

Similarly, this type of switching happened for other facilitators, usually as spontaneously and responsively as Kate described it.

The realities of local language use meant these patterns of spontaneous translation were preferable to providing material in multiple languages. John described:

> We are all about English, English, English. Unfortunately, our local language has been termed as vernacular. There has been a discouragement of speaking it, especially in schools. There has been insistence on speaking English. We have lost it. The literacy rate on our local dialect rate is super low. Almost 90% of people of every tribe can only speak it.

This reality meant formal translation into local dialects was impractical since local languages were not always written. John said that he can speak his native language, but he wouldn't be able to read it very well. Therefore, the practice of language localization meant facilitators needed to translate the manual, and, as Kate mentioned, for best understanding facilitators and students spoke Twi. Language switching was a spontaneous form of localization. John described the banter of his class as they got into a flow and mixed English and Twi: "we were very free with each other. We could speak in our boys' voice and tease each other. . . . People were laughing and we could say whatever they want to say. It's involuntary, spontaneous." This pidgin style—so important to the character of the class—demanded spontaneous emergence, further suggesting the importance of in-the-moment over formal translation.

Building Literacy

Another issue with language arose due to the emerging literacy levels of some class participants. According to Rebecca, just because a person could pronounce the words in the manual did not mean they could understand it. Some amount of translation was done to deal with lower literacy levels.

> Almost all the classes you had to explain in the local language because some might say, "we understand," but when you ask them the question, they actually don't bring out anything. All the time, I had to translate it to the local language.

Similarly, John specifically mentioned that it was the role of the teacher to do the translation. "It's the responsibility of the facilitator to know how to break things down for the participants, not you [the designer] necessarily." This statement also reflected how language localization was key to better understanding by breaking things down for the learner. The lessons were taught in English, but the explaining and expression happened in participants' mother tongue. Responding to student literacy levels, the facilitators filled their role by "breaking it down" for students. In fact, there were language teaching moments during the course. Rebecca told us:

> it was almost every time. There was an opportunity for them to learn new words, so that was how the language was used in a good way. To learn words and new vocabularies that they could use in their communication.

There was a positive effect in this instance of enhancing English literacy; however, as John mentioned, historically, learning English came at the expense of maintaining fluency in native languages.

Cultural Recontextualization

Spontaneous Adjustments Occurred in the Moment of Teaching

Several facilitators commented on localization of content occurring without thought or preparation. For instance, John told us that "preparation is important. However, there are still things that are going to happen in the moment. If you pay a lot of attention and catch clues, there will be things that make it better." John further described a story of one class in which there were refreshments for after the session, and there were more than enough. While the lesson from the OER manual was on the topic of equality and had a picture of a child being left out for being different, John saw an opportunity to create a relevant activity with the refreshments and told the class that the extra refreshments would go to the oldest members of the class.

> It was spontaneous. . . . We were talking about equality. With the extra [food], what is going to happen? Even it isn't going to be sufficient. What are we going to use to determine who gets the surplus? Suddenly I thought, "we can make something out of this." . . . You had those who felt like they were not treated equally vented out their feelings. "Why? No! You can't." . . . Even though it was a discussion, we were able to witness real-life feelings and concerns and displeasure of inequality.

John's example showed a major adjustment from what was in the manual based on the relevant context that happened in the natural, spontaneous flow of the course. He used the terms natural and real life to describe the reactions of the class, suggesting this natural learning emerged organically in a specific place and context.

Rebecca told about a class on freedom of religion where spontaneous localization grew out of a tricky emotional context. Some of the class members, who came from a variety of religious backgrounds, had been arguing during the class about which religion was true. This led to some class members becoming upset. Rebecca adjusted the original activity in the manual—sing a hymn—to include several common hymns not from the dominant religion.

> About religion, we used some of our locally made Christian songs. That was what we sang. That brought some people relief, too. They actually realized that though we are from different sects of religions, but when it comes to these things, we are all involved in it.

In making this decision, Rebecca responded intuitively and inclusively to the students.

In a lesson on the right to be free, Beth pivoted in the lesson and substituted a song in the manual for one that was a better cultural fit for her students. In her situation, the original activity was to use a song about rights, but Beth made an adjustment that she knew her students would appreciate. "I got a song that talks about rights. I got them to listen to it, but for the activity, I used the song they would like to get them to dance. I had to improvise." In all these descriptions, the facilitators did not have a process for localization or advice on how to localize, nor did they have a written plan or record. Even so, they created memorable

learning experiences local to the class environment and student needs, demonstrating the spontaneity of informal localization.

Discussion was the Means for Naturally Adding Local Spice

The OER human rights manual the facilitators used was a discussion-based curriculum, which was therefore open in structure and allowed for individual contributions, a central part of the experience of localization. The human rights lessons were designed to invite relevant discussion. Each one started with a discussion trigger such as a picture, activity, or video and led students through a series of questions, allowing participants to share their own experiences related to the specific right they were studying. About this, Kate told us, "I don't think we changed anything [in the manual]. But we made our examples that we gave become more local . . . we used relatable stories that have been in our everyday lives. We asked relatable questions." Beth appreciated that discussion would "spice the class up." In these examples, the content was not changed, but the discussion around the content effectively localized it. As with Tobias' class about personal heroes, localized via discussion. He had not physically changed the manual, but he said, "even though it's not written, not documented, you have [localized it.]"

In another example Kate recounted how an image in the manual did not represent a student's experience, but the group was able to make the content relevant to themselves through discussion.

> We were talking about education. . . . There was a picture of a child watching a computer. She said growing up she didn't have things like that. There weren't so many computers. When she grew up, she came to appreciate education, and she came to realize that education was not just formal education. Learning things. . . . Learning how to be with people. Learning how to communicate with people.

Though the picture did not relate to the student's experience growing up without computers, students supplied the cultural relevance, since the lesson did not. Even so, the lesson's discussion format provided space for sharing individual perspectives.

Social Responsiveness

For in-the-moment localization, facilitators were motivated by their knowledge of their students and the relationships they had with them. Decisions about how to adjust content were based on how to make students feel respected or how to help them understand, and it was important for facilitators to know their students well in order to localize. For instance, Tobias suggested, "you have to know the kind of people you are addressing at that moment." For Randall, this meant knowing about them so he could tailor the content to his students. He recommended that facilitators should:

> Know the people you are going to teach. Know their surroundings, whatever they are surrounded with, why, and relate the content to what they have will make an impact that will be meaningful to them, rather than making reference to things they can only just imagine.

Rebecca also described her experience where ideas occurred to her in the moment for her to help her students.

> We get new ideas as we go through the manual. New ideas come. New thoughts come. New ways come to our minds on how we can best help people to understand these things that we are training them with so that it will be part of our lives forever and ever.

In this statement, Rebecca connected moments of creativity with deep learning that stays with the students and becomes "part of our lives forever."

John experienced another type of social responsiveness important to localization: viewing his students as he viewed himself. That relationship was the impetus for inviting participation and making decisions that changed the course to suit his learners.

> The moment I see you, I see you as me. . . . My main goal is to focus on everyone there and to bring out what they know because they all have something. Because I have thoughts and experiences, I feel that everybody does.

Localization here involved "bringing out what they know." John's advice to other facilitators on how to do this was to "focus on people and less on content." The ability of facilitators to see their students as they saw themselves led to greater localization of the lesson, as students were invited to contribute.

Discussion

The results of this study developed a picture of the many interrelated ways informal localization was significant for facilitators adopting OER. Indeed, our findings were consistent with prior research carried out in other educational settings, where informal practices have been found to be as, or even more, significant than formal processes (e.g., Mælan et al., 2020; Author, in press). As Dunne (1997) summarized, practices are characterized by "unpredictability [and] open-endedness" (p. 359) necessitating flexibility and responsiveness to the details of individual situations for the best chances of achieving desirable results. Consistent with this ideal, our findings also suggest several implications for OER designers about maintaining local responsiveness and flexibility. These center around the challenges of depending on technology to facilitate localization, the importance of OER designers intentionally leaving space for informal localization, as well as allowing for linguistic flexibility in translation and localization.

Challenges with Depending on Technology

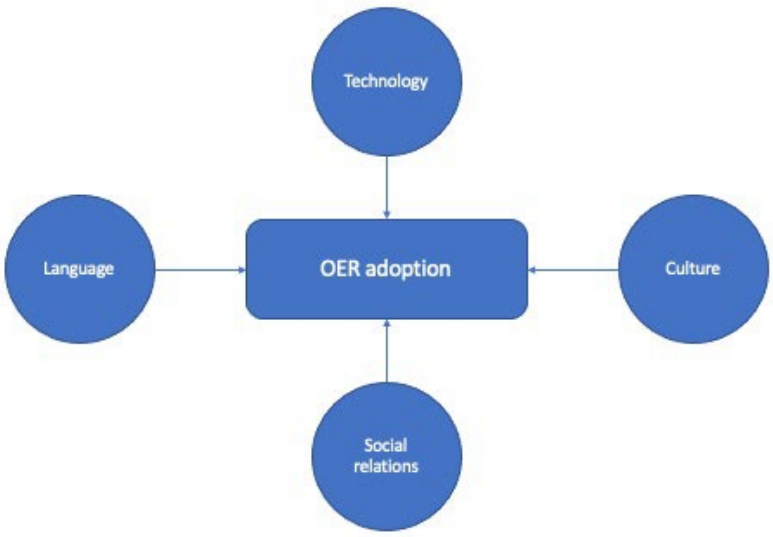
The findings of our study were consistent with prior research describing the challenges technology access can impose on those attempting to use OER (de los Arcos & Weller, 2018; Ezumah, 2020; Omoike, 2021). Some of our participants' localization practices were even meant to overcome issues with technology. Participants also did not depend on technological tools or open platforms to localize content (as is often the case in the Global North, see DeRosa, 2016). This differing pattern of use suggests that OER producers should think critically about creating OER that depends upon technology, and not assume the benefits technology provides are self-evident or beyond dispute. Given the history of the Global North introducing educational practices into the Global South that had unintended effects (Ezumah, 2020), it may be short-sighted to depend wholly on similarly created, formal techniques of OER localization.

Intentionally Leave Space for Informal Localization

One of the key findings of this study was that facilitators culturally localized the provided OER materials through informal practices (Amiel, 2013). Some of our participants' informal localization practices were undertaken to appeal to different learners, based mostly on their social relationships and shared cultural context. In fact, social relationships were such an important part of how our participant's localized OER that we added it to the other three components of the localization framework explored at the outset of this study (Figure 3). Localization also tended to take place through spontaneous decisions in the moment of teaching. Together, these observations question the value of tightly scripted content that teachers can use as is. Practically speaking, given the evidence that facilitators will exchange content and rearrange it to fit their context, efforts to fully script content could end up being counter-productive, as noted by Wiley (2021) in his blog post aptly titled, "The Localization Paradox."

Figure 3

Updated Framework of OER Adoption Factors



One of the ways designers can support the kinds of informal localization reported in this study is through the use of discussion elements in a course. Our participants noted that even if they went straight by the lesson in the original manual, the discussion format allowed them to add personal experiences, or to add their own spice, which they considered localization. The space created by discussion allowed local participants to add their own color and relevance, even if learners did not specifically relate to the content. Both our participants and (at least according to their report) their students found the highlights of a course coming through discussion, including the understanding, tolerance, and empowerment they thought they developed. In fact, less relevant content was rendered relevant as individuals added their personal applications. This is an important point because, the first author—as a designer from the United States—was initially cautioned by other US designers not to use a discussion format because the typical African

education experience followed a lecture model and students would not respond well to requests for discussion. Our study complicated that assumption and supported the practice recommendations of Arinto et al. (2017) to promote teachers' professional development and "participatory pedagogy" (p. 589) such as discussion as means of empowerment through OER.

One study of youth knowledge workers in Nepal suggested that localization must be done by locals (Ivins, 2011). As not every facilitator has the time, resources, or inclination to create OER, designers should make efforts to collaborate with learners somewhere along a spectrum of collaborative engagement. On the more engaged side would be close collaboration with shared decision-making, to mid-level consultation, to distant collaboration in which the designer creates explicit invitations in the content such as directing facilitators to insert a story or activity familiar to learners in order to illustrate a particular principle. This type of invitation could create space for informal localization.

Allow for Linguistic Flexibility

Prior literature has indicated that most OER is created in English (Amiel, 2013), requiring translation for non-English speaking learners (and thus implying that the most common localization practice in countries outside of North America is translation; see de los Arcos & Weller, 2018). However, this study indicated the complexities of language needs. For example, a formal translation into Twi, our participants' most common native dialect, would be inappropriate because while they speak Twi, they read and write in the official language of Ghana, which is English. Informal translation by the teacher, therefore, was more appropriate for learners with whom our participants worked. While we recognized (and have advocated for) the need for OER producers to be sensitive to creating materials in local languages, we simultaneously recognized that ultimately even decisions of language should be made by locals—possibly even in-the-moment—because policies mandating translation into local dialects may still not meet learner needs.

Conclusion

One of the major problems with current OER production is that it comes largely from the Global North and is written in English, rendering it linguistically, culturally, and even technologically inaccessible to learners in Ghana. This study explored the practice of localization by facilitators in Ghana who used an OER course designed in the United States and localized it for students in Ghana. Our project took place in context of everyday lives and larger complex social and economic systems, limited bandwidth and technological problems, linguistic differences related to colonial language imposition, and cultural mismatches. It provided a rich portrayal of how localization practices are influenced by several overlaying factors and how facilitators dealt with these challenges through informal localization. This informal localization happened dynamically in the classroom based on relationships and teacher intuition. Facilitators made informal adjustments based on issues of technology, language, the need for cultural recontextualization, and to be socially responsive. These informal practices have implications for designers of OER and how designers could create content with affordances for localization: (a) given challenges with OER technology, do not depend on technology for localization; (b) intentionally leave space for informal localization; and (c) design for linguistic flexibility, using multilingual platforms and acknowledging the benefits of spontaneous

translation to provide appropriate bridging between languages and dialects that fit the needs of students best.

This study indicated the value of informal practices as a first line of localization. In some cases where technological, language, and cultural contextualization present barriers to localization, informal practices were the sole means for facilitators to tailor content to their learners. This is critical to OER research. If OER is to be a valuable resource to users in the Global South, more is needed to understand the practice of using OER in global contexts.

References

Adeyeye, B. A., & Mason, J. (2020). Opening futures for Nigerian education: Integrating educational technologies with Indigenous knowledge and practices. *Open Praxis, 12*(1), 27. https//doi.org/10.5944/openpraxis.12.1.1055

Amiel, T. (2013). Identifying barriers to the remix of translated open educational resources. *The International Review of Research in Open and Distributed Learning*, *14*(1), 126–144. https://doi.org/10.19173/irrodl.v14i1.1351

Aramide, K., & Elaturoti, A. (2021, October 18–22). *Exchanging knowledge across borders: Open education around the world* [Presentation]. Open Education Conference, virtual. https://opened21.sched.com/event/moNW/exchanging-knowledge-across-borders-open-education-around-the-world

Arinto, P. B., Hodgkinson-Williams, C., & Trotter, H. (2017). OER and OEP in the Global South: Implications and recommendations for social inclusion. In C. Hodgkinson-Williams & P. B. Arinto (Eds.), *Adoption and impact of OER in the Global South* (pp. 577–592). International Development Research Centre & Research on Open Educational Resources for Development https://doi.org/10.5281/zenodo.1043829

Churchill, S. D. (2022). *Essentials of existential phenomenological research*. American Psychological Association.

Clinton-Lisell, V. (2021). Open pedagogy: A systematic review of empirical findings. *Journal of Learning for Development*, *8*(2), 255–268. https://doi.org/10.56059/jl4d.v8i2.511

Cobo, C. (2013). Exploration of open educational resources in non-English speaking communities. *International Review of Research in Open and Distributed Learning*, *14*(2), 106–128. https://doi.org/10.19173/irrodl.v14i2.1493

Cox, G., & Trotter, H. (2017). Factors shaping lecturers' adoption of OER at three South African universities. In C. Hodgkinson-Williams & P. B. Arinto (Eds.) *Adoption and impact of OER in the Global South* (pp. 287–347). International Development Research Centre & Research on Open Educational Resources for Development. https://doi.org/10.5281/zenodo.601935

Creative Commons. (n.d.). *About the licenses*. Creative Commons. https://creativecommons.org/about/program-areas/education-oer/

de los Arcos, B., & Weller, M. (2018). A tale of two globes: Exploring the north/south divide in engagement with open educational resources. In J. Schöpfel & U. Herb (Eds.), *Open divide: Critical studies on open access* (pp. 147–155). Litwin Books.

de Oliveira Neto, J. D., Pete, J., Daryono, & Cartmill, T. (2017). OER use in the Global South: A baseline survey of higher education instructors. In C. Hodgkinson-Williams & P. B. Arinto (Eds.),

Adoption and impact of OER in the Global South (pp. 69–118). International Development Research Centre & Research on Open Educational Resources for Development. https://doi.org/10.5281/zenodo.599535

DeRosa, R. (2016, May 18). *My open textbook: Pedagogy and practice*. http://robinderosa.net/uncategorized/my-open-textbook-pedagogy-and-practice/

Dunne, J. (1997). *Back to the rough ground: Practical judgment and the lure of technique*. University of Notre Dame Press.

Ezumah, B. A. (2020). Critical and cultural perspectives of educational technology transfers and theoretical frameworks. In *Critical perspectives of educational technology in Africa* (pp. 49–67). Palgrave Macmillan. https://doi.org/10.1007/978-3-030-53728-9_3

Fleming, V., Gaidys, U., & Robb, Y. (2003). Hermeneutic research in nursing: Developing a Gadamerian-based research method. *Nursing Inquiry*, *10*(2), 113–120. https://doi.org/10.1046/j.1440-1800.2003.00163.x

Ivins, T. (2011). *Localization of open educational resources (OER) in Nepal: Strategies of Himalayan knowledge-workers* [Doctoral thesis, Brigham Young University]. BYU Scholars Archive. https://scholarsarchive.byu.edu/etd/2616/

Kimmons, R. (2016). Expansive openness in teacher practice. *Teachers College Record, 118*(9), 1–34. https://doi.org/10.1177/016146811611800901

King, M., Pegrum, M., & Forsey, M. (2018). MOOCs and OER in the Global South: Problems and potential. *The International Review of Research in Open and Distributed Learning, 19*(5). https://doi.org/10.19173/irrodl.v19i5.3742

Mælan, E. N., Tjomsland, H. E., Samdal, O., & Thurston, M. (2020). Pupils' perceptions of how teachers' everyday practices support their mental health: A qualitative study of pupils aged 14–15 in Norway. *Scandinavian Journal of Educational Research*, *64*(7), 1015–1029. https://doi.org/10.1080/00313831.2019.1639819

McDonald, J. K. (in press). The everydayness of instructional design and the pursuit of quality in online courses. *Online Learning*.

Oates, L., & Hashimi, J. (2016). Localizing OER in Afghanistan: Developing a multilingual digital library for Afghan teachers. *Open Praxis*, *8*(2), 151–161. http://dx.doi.org/10.5944/openpraxis.8.2.288

Omoike, A. (2021, Oct. 18–22). *Open pedagogy and practices for sustainable education in Nigeria* [Video, conference session]. Open Education Conference, virtual. https://opened21.sched.com/event/moNi/open-pedagogy-and-practices-for-sustainable-education-in-nigeria?iframe=no

Packer, M. (2018). *The science of qualitative research*. Cambridge University Press.

Prinsloo, P., & Roberts, J. (2022). Analysis of higher education (HE) systems' approach in South Africa: National infrastructures for digital educational resources. In V. I. Marín, L. N. Peters, & O. Zawacki-Richter (Eds.), *(Open) educational resources around the world: An international comparison*. EdTech Books. https://edtechbooks.org/oer_around_the_world/analysis_of_higher_e

Raj, S., Salman, A., Kumar, B., & Ace, B. (2019). Policy paradox between local and national agencies of education: A lived experience from local curriculum development practices in Nepal. *International Journal of Education and Research*, *7*(3), 159–170. https://www.researchgate.net/publication/332289034_Policy_paradox_between_local_and_national_agencies_of_education_A_lived_experiences_from_local_curriculum_development_practices_in_Nepal

United Nations Educational, Scientific and Cultural Organization. (2012). *2012 Paris OER declaration*. http://www.unesco.org/new/fileadmin/MULTIMEDIA/HQ/CI/CI/pdf/Events/English_Paris_OER_Declaration.pdf

West, P. G., & Victor, L. (2011). *Background and action paper on OER: A background and action paper for staff of bilateral and multilateral organizations at the strategic institutional education sector level*. The William and Flora Hewlett Foundation. http://oerbackgroundpaperdraft.pbworks.com/w/page/37756032/FrontPage

Wiley, D. (2021, June 28). The localization paradox. *Improving Learning*. https://opencontent.org/blog/archives/6819

Wiley, D., & Hilton III, J. L. (2018). Defining OER-enabled pedagogy. *International Review of Research in Open and Distributed Learning, 19*(4). https://doi.org/10.19173/irrodl.v19i4.3601

William and Flora Hewlett Foundation. (2013). *Open educational resources: Breaking the lockbox on education* [White paper]. William and Flora Hewlett Foundation. https://hewlett.org/wp-content/uploads/2016/08/OER%20White%20Paper%20Nov%2022%202013%20Final_0.pdf

Wolfenden, F., & Adinolfi, L. (2019). An exploration of agency in the localisation of open educational resources for teacher development. *Learning, Media, and Technology, 44*(3), 327–344. https://doi.org/10.1080/17439884.2019.1628046

Yanchar, S. C., & Slife, B. D. (2017). Theorizing inquiry in the moral space of practice. *Qualitative Research in Psychology, 14*(2), 146–170. https://doi.org/10.1080/14780887.2016.1264517


Athabasca
University


BY

International **R**eview of **R**esearch in **O**pen and **D**istributed **L**earning
Volume 24, Number 2

May – 2023

Developing a Conceptual Model of Self-Directed Learning in Virtual Environments for Medical Sciences Students

Zohrehsadat Mirmoghtadaie[1], Mohsen Keshavarz[2], Noushin Kohan[3,*] and Soleiman Ahmady[4]
*[1]Assistant Professor, Assistant Professor, Department of e-Learning, Virtual School of Medical Education and Management, Shahid Beheshti University of Medical Sciences (SBMU), Tehran, Iran; [2]Department of E-Learning in Medical Sciences, School of Paramedical Sciences, Torbat Heydariyeh University of Medical Sciences, Torbat Heydariyeh, Iran; [3]Department of Medical Education, Smart University of Medical Sciences,Tehran, Iran; *corresponding author; [4]School of Management and Medical Education, Shahid Beheshti University of Medical Sciences, Tehran, Iran*

Abstract

Identification of key factors affecting the self-directed learning process in the virtual environment of medical education is vital. In this article, we designed a model that describes the self-directed learning process in the virtual learning environment for post graduate students of medical sciences in Iran. This study was carried out in two steps: first, using a qualitative study, we explored the formation of a self-directed learning process in the virtual environment. Second, a review of the literature was conducted to identify the conceptual models. Finally, based on the results, a self-directed learning model for virtual learning was developed. A total of 25 people were research participants in the qualitative part, and individual interviews were conducted with both faculty members and students. There were 1,049 codes, 80 subcategories, 15 categories, and 5 themes extracted from the interviews and through analysis. The themes included (a) backgrounds and requirements, (b) support, discipline, and coordination of the educational system, (c) students' effort to manage to learn, (d) efficiency, attractiveness, and organization of educational environments and context, and (e) personal excellence, growth, and development. The self-directed learning process in virtual environments consists of some elements and structures, and a description of the relationship between these elements can be the basis of educational planning to develop and compile an effective evaluation of this skill.

Keywords: self-directed learning, virtual learning environment, medical sciences, student

Introduction

In the 21st century, with the ubiquity of technology, entering the virtual world is a very common practice (Garrison, 2011). Online learning refers to teaching and learning processes that are provided through the Internet. It includes a wide range of applications to access educational materials, as well as to facilitate teacher-student interaction (Keshavarz, Mirmoghtadaie, & Nayyeri, 2022). A report by Allen and Seamen in 2013 stated that about 6.7 million students took virtual courses in 2011, denoting an increase of about 570,000 students compared to 2010 (Allen & Seaman, 2013).Virtual education is also very common in the field of health sciences (Kohan et al., 2021). The advantages of such courses include the possibility of independent learning and the availability of resources and information at all times (Ellaway & Masters, 2008; Bagheri-Nesami et al., 2021).

Today, in the digital age, one of the main attributes that learners need to have is the skill to learn in new digital environments. For this reason, teachers must be familiar with digital-age teaching techniques to manage and lead online classes (Kohanet al., 2021; Goldberg & Lannoye-Hall, 2023). However, in line with advances in virtual education in medical sciences, it is necessary to change instructors' teaching methods from traditional models to technology-supported modernized models (Cooket al., 2011; Antonietti et al., 2023). In recent years, e-learning systems have been increasingly influencing both classroom and campus-based teaching, but more primarily, such systems are leading to new models or designs for teaching and learning (Mirmoghtadaie et al., 2023). Attention should be paid to the instructional design of a virtual learning environment distinctively and flexibly based on fundamental learning theories like constructivism and connectivism (Goldie, 2016; Liyanagunawardena & Williams, 2014; Connolly & Wicks, 2023).

E-learning encourages and supports active learning regardless of time and place using certain principles and tools such as web-based communication, participation, knowledge transfer,and multimedia. Therefore, it is considered a key innovation in education (Cummings et al., 2017). With an increase in official and non-official educational opportunities in electronic learning environments, there is much debate over virtual self-directed learning (Goh & Sandars, 2020). Self-direction in virtual learning plays an important role in the success of virtual learners. On the other hand, the flexibility of virtual environments in terms of time, place, and speed of learning increases the possibility that virtual learners accept responsibility for their learning experiences (Rashid & Asghar, 2016; Song & Bonk, 2016; Kara, 2022).

Digitization has transformed opportunities for self-directed learning in informal, non-formal, and formal educational settings. Digital technologies facilitate easy access to information, which facilitates self-directed learning; however, the increasing volume of available information necessitates additional learner skill in information literacy—part of being a competent self-directed learner—in order to navigate information in a meaningful way (Kara, 2022).

The Accreditation Council for Graduate Medical Education (ACGME) considers self-directed learning (SDL) as one of the six key competencies for medical graduates, essential for development and promotion (Education, 2013). In other words, SDL is regarded as a very important strategy in medical education (Shokaret al., 2002; Elshami et al., 2022). The concept of SDL is defined by Knowles as "a process in which individuals take the initiative, with or without the help of others, in diagnosing their learning needs, formulating goals, identifying human and material resources for learning, choosing

and implementing appropriate learning strategies, and evaluating learning outcomes" (Knowles, 1975, p. 18).

Several models have been proposed for understanding SDL in a face-to-face environment. Brockett and Hiemstra (1991) proposed a logical basis for two models in SDL perception. In the first model, learning is viewed as a process in which the learner accepts responsibility for planning, implementing, and evaluating the learning processes. In the second model, SDL was considered to be an objective, and the student must try to achieve that objective. Both the process and the personal attributes of the learner are considered in these models (Brockett & Hiemstra, 2018). According to a model proposed by Garrison, SDL is composed of three dimensions that interact with one another, including self-management, self-monitoring, and motivation. Garrison's model focuses on using resources, learning strategies, and motivation (Garrison, 1997). Song and Hill (2007) proposed a conceptual model for understanding SDL in virtual environments. In this model, the concept of SDL is viewed as a personal attribute of the learner and the learning process. Moreover, a third dimension is context, and it is important to understand environmental factors (i.e.,virtual learning) and their effects on self-direction.

An integrative appraisal of 14 models for self-directed learning has revealed a basic connection between them and suggests an integrated model based on eight characteristics. This integrated model will help researchers by offering a collection of fundamental construct for creating the factors of a theoretical SDL model (Uys, 2021).Face-to-face education was a dominant method in higher education when the majority of the primary SDL models were developing, and limited attention has been paid to developing models addressing SDL in virtual learning environments; therefore, more comprehensive models are required to investigate electronic learning in the process of self-direction. Learning is largely influenced by cultural and social factors. Hence, it is necessary to study SDL in different cultures. Few studies have addressed SDL in Iran. This study was conducted to fill this gap by designing a SDL model for virtual learning environments for postgraduate students of medical sciences in Iran.

Method

This study was carried out in two steps. In the first step, using a qualitative study with a content analysis method, we described the formation of the SDL process in virtual postgraduate students of medical universities and investigated their experiences. Secondly, a review of the literature was conducted to identify and evaluate the conceptual models and frameworks of SDL. Combining the two steps led to the formation of the SDL process model in the virtual environment. The study setting included five top medical sciences universities in Iran. Thepurposeful sampling method was used in the present study. The inclusion criteria for the students and the virtual teachers were, respectively, two terms of passing virtual courses and at least two years of teaching virtual courses. The sampling continued until data saturation was achieved.

Step 1: Qualitative Research

Data Collection Method

The data collection was done through semi-structured interviews after obtaining the participants' informed consent and explaining the research objectives to them. The interviews lasted 35–90 minutes, with an average of 63 minutes, and were immediately transcribed. During the interviews, students were asked questions such as "Would you please tell us your independent learning experience in the virtual environment?", "What activities did you have during the independent learning process in virtual education?", and "What factors were involved in your learning in the virtual environment?" Also, the virtual teachers were asked questions such as "What were your experiences of directing the students during the learning process for them to beself-directed in a virtual environment?" and "What was your understanding of guiding the students during the self-directed learning process?" Some probing questions were also asked to clarify participants' responses. Once 25 participants were interviewed, data saturation was achieved, but four more interviews were done to confirm.

Data Analysis

To analyze the data, the conventional content analysis approach was used,in which the themes and categories were extracted from the content of participants' text data, regardless of previous theoretical approaches. To achieve data immersion, the researchers listened to the interviews several times and transcribed them. This technique helped identify meaning units. The script of each interview was then readline-by-line, and all the words, sentences, and paragraphs, including meaning units, were encoded. The data and codes created were continuously compared. Accordingly, the codes were classified based on similarities. The initial categories were in turn classified and formed more abstract categories.

Ethical Consideration

The research was approved by the Ethics Committee of Tehran University of Medical Sciences (Code: IR.TUMS.MEDICINE.REC.1395.713). The required information, research objectives, data collection methods, confidentiality of participants' information, and ethical considerations were sent to them through e-mails and also explained before the interviews.

Trustworthiness

The four features of credibility, conformability, dependability, and transferability were used to ensure the trustworthiness of the data and findings of our research (Connelly, 2016).The credibility of findings was confirmed using techniques such as member checking and prolonged engagement inthe study (about two years) as well as establishing close relationships with the participants. To increase the conformability of the findings, methods such as peer checking were used. To this end, some of the data and findings were sent to two experienced qualitative researchers and two doctoral students of medical sciences for feedback. The steps of the study were written down to confirm data dependability. Besides, to increase the transferability of the findings, a sampling technique was used with maximum variation in gender, major, and university.

Step 2: Literature Review

The Conceptual Model of Self-Directed Learning Process in Virtual Learning Environments

In this step, SDL models were studied. The relevant models were selected based on the evaluation criteria of Fawcett's models derived from the study by Brathwaite (2003), including comprehensiveness of content, logical congruence, conceptual clarity, abstraction level, and utility (Brathwaite, 2003). Finally, based on the information obtained from the review of related models and the results of qualitative studies, a primary SDL model for virtual learning was developed. To reach aconsensus of experts, the initial draft of the model was presented and discussed through the nominal group technique at the meetings of the expert groups. The proposed model was ultimately approved after receiving the experts' comments and applying the necessary modifications.

Results

The samples included 11 virtual instructors and 14 virtual students, the demographic characteristics of whom are presented in Table 1.

Table 1

Demographic Characteristics of the Participants in Qualitative Research

Characteristic	E-Teachers	Students
Gender		
Male	1	4
Female	10	10
Mean age	48/3 years	37/2 years
Education		
PhD	10	2
MSc	1	12

Note. $N = 25$.

Qualitative Content Analysis

Students' and instructors' experience of SDL in virtualenvironmentsis a unique experience shaped by educational factors, atmosphere, and culture. This experience is a structure consisting of the elements and phenomena associated with SDL and virtual environments. The primary codes, including 1,222 phrases, were classified into 80 subcategories, 15 categories, and 5 themes. The themes and categories are shown in Table 2.

Table 2

Themes and Categories From Qualitative Research

Number	Theme	Categories
1	Backgrounds and requirements: Prerequisites of self-directed learning in virtual environments (readiness to learn)	Capable and unremitting instructors Ready learners Learning culture and institution atmosphere
2	Support, discipline, and coordination of the educational system (directed toward a goal)	Supportive educational management Purposeful teaching Supporting and guiding the students
3	Students' effort to manage to learn (purposeful effort)	Deep and thoughtful learning Students' excellent performance
4	Efficiency, attractiveness, and organization of educational environments and context (interest in learning environments)	Use of learning strategies Flexible learning environment Pleasant learning environment
5	Personal excellence, growth, development (excellence and progress)	Educational outcomes Cognitive and personality outcomes Social outcomes Emotional outcomes

All subcategories and categories were extracted from participants' views. Table 3 shows the statements of several participants.

Table 3

Themes, Categories, and Statements of Participants Derived From Qualitative Research

Themes	Categories and Statements
Backgrounds and requirements: Prerequisites of self-directed learning in virtual environments (readiness to learn)	Capable and unremitting instructors "I think my role is to design an educational environment for effective student learning, but I also need to have the knowledge and art of how to design an effective environment." (P10) Ready learners "Motivation and attitude also lead to personal pursuit. If I do not know something, I will go and try it myself and learn, and if I see

		inappropriate circumstances, I will change it." (P8)
	Learning culture and institution atmosphere	
		"In the educational system, the flow of information is one-way, always from the teacher to the student." (P9)
Support, discipline, and coordination of the educational system (directed toward a goal)	Supportive educational management	
		"We must teach in such a way that the graduate can find her way in the real environment." (P21)
	Purposeful teaching	
		"We must set a pre-program for it. Make a plan to know what to do and what assignments to do. When and how often." (P17)
	Supporting and guiding the students	
		"The most important element of self-management in cyberspace is interest and motivation, which here if you involve the student in setting goals by the future career process, will indirectly increase student motivation." (P20)
Students' effort to manage to learn (purposeful effort)	Deep and thoughtful learning	
		"When I entered the virtual environment, my reading habit changed spontaneously. When I entered the virtual environment, I saw that I had to go and print every day and read." (P18)
	Students' excellent performance	
		"My study was using virtual learning facilitators. For example, I became familiar with the concept map on the Internet or used blogs and social media." (P6)
	Use of learning strategies	
		"When I was evaluating myself, if my mistakes were too many twice, I was looking for the reason, and this helped me to learn and study later."

	(P11)
Efficiency, attractiveness, and organization of educational environments and context (interest in learning environments)	Flexible learning environment "Traditional classes with e-learning are very helpful. But the amount should be based on the needs of the student and the type of course." (P13) Pleasant learning environments "The course content has not attractive and we are unmotivated. As a result, we get a PDF file and finally we print it." (P19)
Personal excellence, growth, and development (excellence and progress)	Educational outcomes "If my emphasis is not on the score and I do not have stress, my creativity will increase a hundredfold." (P9) Cognitive and personality outcomes "Last semester we had a class where the students ran the classroom themselves. It was great because we had to search for virtual submissions and our self-confidence was higher than in the past." (P17) Social outcomes "We can also motivate students with homework. When you give the student correct and complete feedback, the student is happy." (P11) Emotional outcomes "One or two semesters later, I was not worried when a project was offered. I felt that with time management I could deliver a good project to the master." (P14)

Note. P = participant.

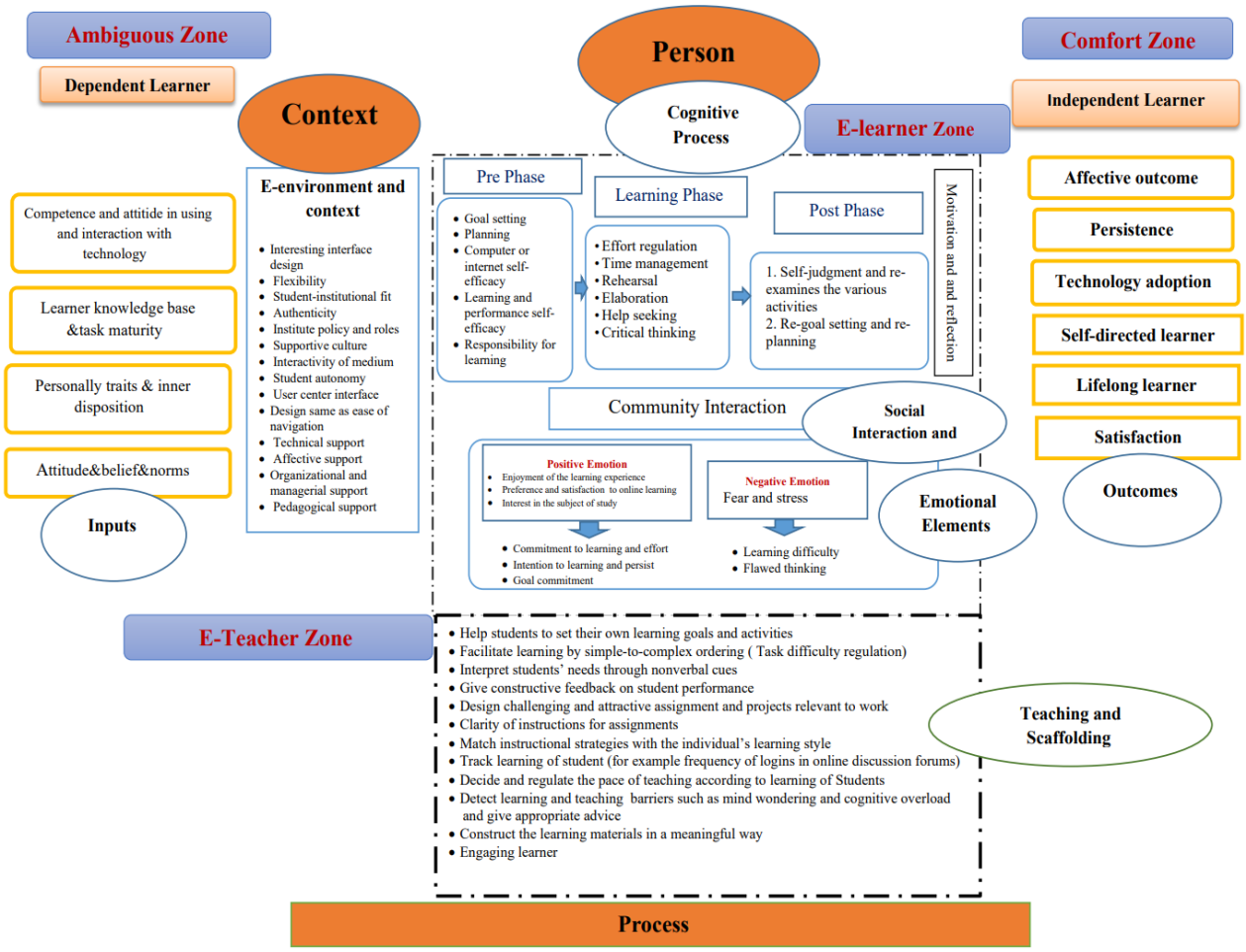
Conceptual Model

Based on the information obtained from reviewing the models according to the desired criteria and focusing on the findings of the qualitative part, a conceptual model of the SDL process in the virtual environment was proposed. In the conceptual model extracted, it was assumed that students would be influenced by various factors when moving from dependent learners toself-directed learners. This model addresses the elements that influence students' SDL skills in virtual learning environments

based on individual and environmental factors as well asan educational background through a systematic process. The model is shown in Figure 1.

Figure 1

Initial Conceptual Model of the Self-Directed Learning Process in Virtual Environments



Requirements and Prerequisites

This structure refers to the requirements of educational environments and the individual factors associated with students and provides a background for SDL by students. The requirements include skills, attitudes, and willingness of the students to use and interact with technology and accept virtual learning as effective learning. Some other factors are also influential, such as students' basic knowledge and skills related to learning tasks, as well as their personality traits including self-control, self-management, learning motivation, and lack of feeling isolated in the educational environment.

Educational Context and Environment

An educational context in the virtual environment is provided through e-learning management systems, and self-direction principles should be considered in the design and implementation of such

a context. Controlled access to curriculums, support for virtual learning, and tracking students' activities can be possible through this system. Based on the conceptual model in this research, virtual learning environments should be attractive, flexible, and authentic. Meanwhile, students should be technically, educationally, and emotionally supported. Other factors such as institutional rules and regulations, cultural factors, and backgrounds are also influential.

Intelligent Teaching and Instructional Scaffolding

Directing dependent learning towards SDL is done under the supervision of virtual instructors and through a process called instructional scaffolding. Using digital tools, virtual instructors facilitate the process of active production of knowledge by students. According to the conceptual model in the present study, this structure includes concepts such as helping students to determine the goals and activities of learning, providing the activities and resources in the order of easy to hard, providing constructive and timely feedback to students, designing challenging activities and assignments based onreal scenarios and relevant to the students' future careers, considering learning styles, tracing the students' learning status, deciding on teaching speed, and encouraging student engagement.

Emotional Elements

According to the conceptual model in this research, positive and negative emotions affect the cognitive process of virtual students and their emotional presence in virtual environments. Positive emotions include: enjoying SDL experiences in virtuallearning environments, preferring virtual learning for in-person learning, and interest in the subject, which is often followed by an effort to learn and commitment to achieve the learning objectives. Negative emotions include fear and anxiety, which are mainly caused by factors such as being isolated in the learning environment, lack of time management, and inability to accept various roles and responsibilities in the virtual environment.

Cognitive Process

Based on the conceptual model of this research, students go through pre-learning, learning, and post-learning phases when moving towards self-direction in their cognitive atmosphere. Determining learning objectives and planning for learning happen in the pre-learning phase, and students are expected to have adequate cognitive self-efficacy to use the Internet and computers. During the learning phase, virtual students use strategies such as effort regulation, time management, help-seeking, critical thinking, repetition, and exercises to achieve learning objectives. In the post-learning phase, students will assess and judge themselves ontheir learning performance, and if the learning goalsare not achieved, the students will set the goals again and plan for learning. During this process, rethinking performance and having the motivation to learn is essential and will lead to student maintenance in the process of SDL.

Participation in Learning Communities

Information transfer is not involved in the promotion of SDL skills. On the contrary, negotiation and discussion are mainly emphasized. What matters is the interaction of learners. Such interactions can be synchronous or asynchronous. Virtual students do not only learn from their instructors, but they are also taught through discussing with each other in learning communities (Kohanet al., 2022).

Self-Directed Learning Outcomes

It is expected at the end of each SDL phase that virtual students will achieve outcomes such as being lifelong learners, being self-directed learners, having a sense of satisfaction, adapting to

technologyand the use of the virtual education system, and emotional outcomes such as attachment and eagerness to learn.

Discussion

The results of this study led to a model that depicts the SDL process in virtual environments for medical students. The model was obtained through the qualitative phase data and review of the literature. Although various studies have been done on the design of SDL models in conventional environments and through processes, little attention has been paid to explaining this process in cyberspace. Candy introduced an SDL model in 1991. He had a structuralist approach and believed that personal competencies such as self-management skills were the basis of SDL. Promoting such competencies required continuous effort in the educational environment. He stated that learners showed different levels of self-direction in different learning situations (Candy,1991). In his model, as in the proposed model in this research, personal competencies were referred to as arequirement of self-direction.

Grow (1991) suggested the staged SDL model which focuses on the learning and teaching process. In this model, the instructor guides learners to move from dependence to self-direction through four steps. Each step involves techniques that can be used by the instructor to help learners move to the next step. Grow's model is a typical example of an educational model because it refers to a structure used by instructors who intend to use the self-directed philosophy in teaching.In his opinion, learners go through four stages to achieve self-direction: dependence, interest, involvement, and self-direction (Grow, 1991). Like our model, it focuses on the self-direction process and the factors affecting teaching. However, the two models differ in terms of the type of learning environment.

In Garrison's comprehensive model (1997) previously referred to, knowledge and meaning are formed individually and socially, through a meaningful procedure. The self-monitoring structure in his model is responsibility and commitment to building new knowledge based on prior knowledge. The self-management structure in this model refers to the importance of the learner's control over the learning environment. The other structure of this model is entering motivationand continuous motivation to work on the learning task (Garrison, 1997). It is similar to our model as bothare focused on the student's cognitive presence in the field of learning.

Pilling-Cormick (2002) stated that the three main elements of the SDL process model were as follows: controlling the learning process, the interaction between the student and the instructor, and the factors influencing this control and interaction. To him, the factors influencing a student's control over the learning environment were social constraints, environmental characteristics, and student's and instructor's characteristics. Besides, learning was an active process based on the interaction between a student and aninstructor (Pilling-Cormick, 2002). Both Pilling-Cormick's model and ours take into consideration that SDLis a process and the factors affecting it include the establishment of instructor-to-student interactions and learner's control over the learning process.

Knowles (1980) illustrated SDL as linear and sequential models. But all these models explained that learning was self-directed and that finding learning needs, identifying resources, implementing learning strategies, and evaluating outcomes should be done individually (Briton, 1996). The similarity between their model and ours is that both focus on students' cognitive process in terms of

determining learning objectives, identifying resources and learning strategies, and finally, evaluating learning outcomes.

According to Brockett and Hiemstra (1991), SDL has two different dimensions: a process in which learners take responsibility for all aspects of learning, and learners' personality traits that refer to their tendency to accept this responsibility. The structures considered in their model, named personal responsibility orientation (PRO), included learning context and environment, individuals' ability and tendency to control learning, and personal responsibility for learning (Brockett & Hiemstra, 1991). Their model is similar to ours as both consider the educational setting and personal characteristics for control in SDL.

A conceptual model for understanding SDL in virtual environments was presented by Song and Hill (2007). The model has six main components including input, personal characteristics, autonomy processes, design, support, and outcomes (Song & Hill, 2007). It is similar to our model as they are both process models and take into account requirements such as learners' prior knowledge and their characteristics, as well as cognitive processes and SDL outcomes. In our proposed model, educational settings as well as SDL requirements and other structures of the model are addressed in more detail in virtual environments. Also, structures such as emotional elements and presence in the learning environment are described.

The limitation of the present study was the lack of enough experts in SDL as a specific concept in virtual education.

Conclusion

In this study, by explaining the concept of the SDL process in e-learning, a conceptual framework was developed. The SDL process in virtual environments consists of some elements and structures, and a description of the relationship between these elements can be the basis of educational planning to develop and compile an effective evaluation of this skill.

Limitations

There were some limitations in the present study. One of them, in the qualitative part of the research, is the low sample selection, which suggests caution when generalizing the results. Another limitation was the lack of sufficient expertise in SDL as a concept in the discussion of e-learning. We tried to invite experts who wereknowledgeable about the concept of SDL and virtual education, and had experience of teaching medical students, but we would have liked to have had more participants. It may be worth while to examine the relationship between the concepts in the SDL model in other disciplines. In addition, by designing and implementing interventions based on the model of the SDL process in the virtual environment, the effectiveness of these interventions could be determined. Qualitative grounded theory research should be done to explain the SDL process in virtual education.

Acknowledgment

The researchers appreciate all the virtual instructors and students participating in this study.

Funding

No financial support has been received for the study.

Conflict of Interest

There was no conflict of interest.

References

Allen, I. E. & Seaman, J. (2013). *Changing course: Ten years of tracking online education in the United States*. ERIC. http://www.onlinelearningsurvey.com/reports/changingcourse.pdf

Antonietti, C., Schmitz, M.-L., Consoli, T., Cattaneo, A., Gonon, P., & Petko, D. (2023). Development and validation of the ICAP Technology Scale to measure how teachers integrate technology into learning activities. *Computers & Education, 192*, 1-14. https://doi.org/10.1016/j.compedu.2022.104648

Bagheri-Nesami, M., Ahmady, S., & Kohan, N. (2021). Relationship between information and communications technology engagement with online self-regulated learning in nursing students of Mazandaran University of medical sciences. *Journal of Nursing and Midwifery Sciences, 8*, 253-259. DOI: 10.4103/jnms.jnms_27_21

Brathwaite, A. C. (2003). Selection of a conceptual model/framework for guiding research interventions. *Internet Journal of Advanced Nursing Practice, 6*, 1-10. https://ispub.com/IJANP/6/1/8576

Brockett, R.G., & Hiemstra, R. (1991). *Self-direction in adult learning: Perspectives on theory, research and practice* (1st ed.). Routledge. https://doi.org/10.4324/9780429457319

Candy, P. C. (1991). *Self-direction for lifelong learning: A comprehensive guide to theory and practice*. Jossey-Bass. https://doi.org/10.1177/074171369204200307

Connolly, S. & Wicks, K. (2023). Part-time higher education students' interactions with a virtual learning environment as an exploration of theories of connectivism. *Compass: Journal of Learning and Teaching, 16*, 71-92. https://pubmed.ncbi.nlm.nih.gov/30304614/

Cook, D. A., Hatala, R., Brydges, R., Zendejas, B., Szostek, J. H., Wang, A. T., Erwin, P. J., & Hamstra, S. J. (2011). Technology-enhanced simulation for health professions education: a systematic review and meta-analysis. *Jama, 306*, 978-988. https://doi.org/10.1001/jama.2011.1234

Cummings, C., Mason, D., Shelton, K., & Baur, K. (2017). Active learning strategies for online and blended learning environments. *Flipped Instruction: Breakthroughs in Research and Practice*. IGI Global. DOI: 10.4018/978-1-5225-1803-7.ch006

Education, A. C. F. G. M. (2013). ACGME common program requirements. *Accreditation Council for Graduate Medical Education*, 10-22. https://medicine.umich.edu/sites/default/files/content/downloads/CPRs2013.pd f

Ellaway, R. & Masters, K. (2008). AMEE Guide 32: e-Learning in medical education Part 1: Learning, teaching and assessment. *Medical Teacher, 30*, 455-473. https://doi.org/10.1080/01421590802108331

Elshami, W., Taha, M. H., Abdalla, M. E., Abuzaid, M., Saravanan, C., & Al kawas, S. (2022). Factors that affect student engagement in online learning in health professions education. *Nurse Education Today, 110*, 105261. https://doi.org/10.1016/j.nedt.2021.105261

Garrison, D. R. (1997). Self-directed learning: Toward a comprehensive model. *Adult Education Quarterly, 48*, 18-33. https://doi.org/10.1177/074171369704800103

Garrison, D. R. (2011). *E-learning in the 21st century: A framework for research and practice*. Routledge. https://doi.org/10.4324/9780203838761

Goh, P.-S. & Sandars, J. (2020). A vision of the use of technology in medical education after the COVID-19 pandemic. *MedEdPublish, 9*, 49. https://doi.org/10.15694/mep.2020.000049.1

Goldberg, E. R. & Lannoye-Hall, C. (2023). Adapting learning materials for the digital age: Teacher education during emergency remote learning. *Handbook of Research on Advancing Teaching and Teacher Education in the Context of a Virtual Age* (pp. 176–202). IGI Global. DOI: 10.4018/978-1-6684-8407-4.ch009

Goldie, J. G. S. (2016). Connectivism: A knowledge learning theory for the digital age? *Medical Teacher, 38*, 1064-1069. DOI: 10.3109/0142159X.2016.1173661

Grow, G. O. (1991). Teaching learners to be self-directed. *Adult Education Quarterly, 41*, 125-149. https://doi.org/10.1177/0001848191041003001

Kara, M. (2022). Revisiting online learner engagement: Exploring the role of learner characteristics in an emergency period. *Journal of Research on Technology in Education, 54*, S236-S252. doi: 10.1080/15391523.2021.1891997

Keshavarz, M., Mirmoghtadaie, Z., and Nayyeri,S. (2022). Design and validation of the virtual classroom management questionnaire.*The International Review of Research in Open and Distributed Learning, 23(2), 121–135*. https://doi.org/10.19173/irrodl.v23i2.5774

Knowles, M. S. (1975). Self-directed learning: A guide for learners and teachers. Follett Publishing Company.

Knowles, M. S. (1980). The modern practice of adult education: From pedagogy to andragogy. Prentice Hall/Cambridge.

Kohan, N., Janatolmakan, M., Rezaei, M., & Khatony, A. (2021). Relationship between learning styles and academic performance among virtual nursing students: A cross-sectional study. *Education Research International, 2021*, 1-6. doi: 10.1155/2021/8543052

Liyanagunawardena, T. R. & Williams, S. A. (2014). Massive open online courses on health and medicine. *Journal of Medical Internet Research,16*(8), e197. http://doi:10.2196/jmir.3439

Mirmoghtadaie, Z., Keshavarz, M., Mohammadimehr , M., & Rasouli, D. (2023). The design and psychometric properties of a peer observation tool for use in LMS-Based classrooms in medical sciences. *The International Review of Research in Open and Distributed Learning, 24(1), 66-84.* https://doi.org/10.19173/irrodl.v24i1.6689

Pilling-Cormick, J. (2002). Transformative and self-directed learning in practice. *New Directions for Adult and Continuing Education, 1997*(74), 69-77. https://doi.org/10.1002/ace.7408

Rashid, T. & Asghar, H. M. (2016). Technology use, self-directed learning, student engagement and academic performance: Examining the interrelations. *Computers in Human Behavior, 63*, 604-612. https://doi.org/10.1016/j.chb.2016.05.084

Shokar, G. S., Shokar, N. K., Romero, C. M., & Bulik, R. J. (2002). Self-directed learning: looking at outcomes with medical students. *Family Medicine-Kansas City, 34*, 197-200. https://www.stfm.org/familymedicine/vol34issue3/Shokar197

Song, D. & Bonk, C. J. (2016). Motivational factors in self-directed informal learning from online learning resources. *Cogent Education, 3*(1), 1-11. https://doi.org/10.1080/2331186X.2016.1205838

Song, L. & Hill, J. R. (2007). A conceptual model for understanding self-directed learning in online environments. *Journal of Interactive Online Learning, 6*, 27-42. https://www.researchgate.net/publication/250699716

Uys, W. (2021). An integrative review of fourteen self-directed learning models. *Journal for New Generation Sciences, 19*(2), 48-66. doi: https://journals.co.za/doi/pdf/10.10520/ejc-newgen-v19-n2-a4

International **R**eview of **R**esearch in **O**pen and **D**istributed **L**earning
Volume 24, Number 2

May – 2023

Scrutinizing Learning Management Systems in Practice: An Applied Time Series Research in Higher Education

Esra Barut Tuğtekin
Inonu University

Abstract

This study examined the use of Advancity Learning Management Systems (ALMS) and the Moodle Learning Management Systems (LMS) in learning settings, as well as online exams, within the framework of Transactional Distance Theory. With 146 college students (n_{female} = 102, n_{male} = 44) as voluntary participants, data was gathered through an online questionnaire. A time series design was used for two different LMS sessions, and participants who voluntarily participated in ALMS and Moodle LMS sessions were matched. The findings revealed that while Moodle and ALMS both receive relatively similar assessment ratings for online exams, Moodle scored better in terms of learning setting. When factors of the Learning Management Systems Evaluation Scale (LMSES) based on Transactional Distance Theory were compared, the dialogue and autonomy factors were significantly higher for Moodle LMS than for ALMS. When online exams in the LMS were compared, there was no significant difference between ALMS and Moodle LMS, and for both LMS, the reliability factor was a determinant indicator than the other factors. As a result, in assessing and using an LMS, choices should be based on how well the LMS characteristics address an institution's demands.

Keywords: learning management systems, e-learning, online exam, transactional distance theory

Introduction

Learning management systems (LMS) are used at most institutions throughout the world. Nearly half of university courses will likely be based on e-learning soon, while approximately 42% of Global Fortune 500 companies currently use educational technology tools like LMS to deliver in-service training to their staff (Research & Markets, 2022). Given the changes in learning methodologies and procedures in e-learning settings, there is a high demand for LMS, with the global market expected to reach $25.7 billion by 2025 (Markets & Markets, 2022). Considering that there are more than 1,000 LMS vendors in the e-learning market, choosing an appropriate LMS from the many available is very challenging. Practical testing of different LMS and analyzing their outcomes will help identify the criteria necessary to support those selecting LMS.

Although LMS were first used primarily as supplemental learning tools, thanks to the incorporation of various structures, they have now evolved into a systematic learning environment. The term LMS now describes various software systems that provide learners, instructors, and administrators with synchronous or asynchronous educational services (Elfeky et al., 2020; Turnbull et al., 2019). LMS learning environments are most effective when they consistently provide users with a variety of activities (Jung & Huh, 2019). LMS assist learners by monitoring and recording the learning process, as well as performing various assessments while providing uploaded and requested information. Additionally, they provide access to educational resources, promote tutoring, and monitor and store information on each learner's activities (Kehrwald & Parker, 2019). As a result, a variety of enhancements and constructivist arrangements may be produced on LMS in line with pedagogical objectives and educational goals, and depending on learners' problems and suggestions (Al-Fraihat et al., 2020).

The use of online learning environments for education and training has triggered and significantly enhanced the importance of LMS, particularly amid the COVID-19 pandemic (Huang et al., 2020; Kwon et al., 2021; Raza et al., 2020; Turnbull, 2021). Despite the rise in academic research on LMS, particularly amid the pandemic, most studies have focused on systematic literature reviews or assessing user attitudes. With little quantitative analysis of LMS use in the literature, empirical comparison is limited. Furthermore, institutions may find it difficult to select the LMS best suited to their institutional needs and goals from among the many available. Empirical comparisons of different LMS may provide essential data, guidance, and also serve as a reference for learners, instructors, and managers of institutions selecting and implementing suitable LMS.

Learning Management Systems and Conceptual Framework

LMS provide a highly inclusive environment for learning, including online collaborative learning groups, discussion activities, and frameworks that encourage learners to connect with content as well as other LMS stakeholders (Baxto da Silva et al., 2019; Dias & Diniz, 2014; Jung & Huh, 2019). Using the LMS is a crucial and key factor for learners' performance and academic achievement (Nasser et al., 2011). Learners are encouraged to be autonomous through the use of LMS in e-learning environments (Bradley, 2021; Nasser et al., 2011; Wood et al., 2011) and LMS can encourage learners' engagement since they allow users to monitor the learning process (Al-Fraihat et al., 2020). LMS serve as a multifaceted platform for distributing, sharing, supervising, and monitoring educational content (Watson & Watson, 2007). They also offer a range of options for learners to sign up for courses, monitor

and assess their progress in those courses, and promote engagement (Al-Fraihat et al., 2020; Oakes, 2002). In e-learning environments, even though the learners and their instructors are physically separated, LMS make it possible to establish communication and overcome physical distance through Internet technology.

Moore (1993), who concentrated on the concept of distance in distance learning, called attention to the social and psychological distance brought on by communication gaps. These types of distance might lead to misconceptions and impede the learning process. According to Moore's (1993) Transactional Distance Theory, the detrimental effects of distance may be reduced by influencing one another and developing recurring behavioral patterns (Moore & Kearsley, 1996). Transactional distance has been conceptualized as all kinds of distance that prevent individuals from interacting (Horzum, 2011) and consists of three factors, namely structure, dialogue, and autonomy (Moore, 1993).

Structure describes the combination of features that address learner needs during learner-content and learner-interface interaction, whereas the dialogue factor describes the two-way interactions labelled as learner-instructor and learner-learner. Learner autonomy addresses the issue of choosing learning strategies and how learners' tenets of their own experiences are about how the autonomy factor is managed by learners (Horzum, 2011). The constraints of structure may create an inflexible learning environment and frustrate learners' ability to learn. On the other hand, LMS with a well-developed dialogue factor increases the likelihood of achieving new learning outcomes. Furthermore, supporting the autonomy factor enables learners to freely guide their learning in the LMS. In brief, transactional distance theory recommends that when selecting an LMS, learning materials that improve learners' autonomy and discourse should be included, and the structure factor of the LMS should be regulated to provide a flexible learning experience. It is critical for institutions that will employ LMS to focus on their benefits by analyzing learners' performance throughout the course and the learning outcomes after the course is concluded. Evaluating, organizing, and improving LMS within the context of transactional distance theory will enhance learners' outcomes. In addition, tests—a key component of the learning process—are employed as online examinations in LMS, so it is crucial to consider the potential effects of online examinations on learners and assessment practices. Therefore, while assessing LMS, the course and test processes should be considered together, while the LMS-based online exam options should be evaluated independently.

Online Exams

To evaluate learners' education standing, tests in face-to-face classrooms are generally held synchronously, though with the options provided by distance education, exams can also be held online. The primary distinction between a face-to-face classroom and an online exam is physical presence and synchrony (Jorczak, 2014). While learners take tests synchronously and face-to-face in a classroom setting, they can take online exams synchronously or asynchronously during the exam period designated on the LMS. While exam security for face-to-face tests can be ensured by a hall attendant, automated monitoring solutions are available for online exams if there is a requirement for an attendant (Arnò et al., 2021; Jia & He, 2021; Khalaf et al., 2020; Woldeab & Brothen, 2021). Even with controls using a camera, microphone, and Internet connection during online tests, it is very challenging to obtain the monitoring and evaluation effectiveness afforded by human surveillance. Therefore, an investigation of online exam dependability metrics is ongoing. Additionally, it has been reported that learners may experience varying degrees of exam anxiety due to computer-based exam activities (Jaap et al., 2021). Studies have indicated that students with significant face-to-face test anxiety had lower

(Stowell & Bennett, 2010) or greater (Shraim, 2019) degrees of anxiety in online examinations, and there is a significant relationship between online test anxiety and test performance (Arora et al., 2021; Jaap et al., 2021; Stowell & Bennett, 2010).

Various studies on online tests have compared supervised and unsupervised exam results (Dadashzadeh, 2021; Hollister & Berenson, 2009), as well as face-to-face and online exam methods (Kemp & Grieve, 2014; Weber & Lennon, 2007). However, there have been only limited findings for different online exam environments without supervision. In this current study, both online test and exam activities created in different LMS systems were carried out unsupervised. More time was allotted for test participation than the exam's duration, and learners were permitted to take the exam online asynchronously within the time limitation. Evaluating online test apps across various LMS platforms will be useful step and a fruitful guide, as examinations are a crucial part of any learning setting.

Research Questions (RQs)

In the literature, there is a gap in both the practical and statistical examination of LMS. Thus, the purpose of the current research was to assess online exams as they have been used in these settings, and to compare Advancity Learning Management Systems (ALMS) and Moodle LMS within the context of transactional distance theory. Accordingly, the following RQs were developed:

- What are the descriptive statistics of LMS use and online exam processes for ALMS and Moodle LMS from the students' perspectives?
- Is there a statistically significant difference in students' perspectives on the use of ALMS and Moodle LMS?
- Is there a statistically significant difference between students' evaluations of online exam processes in ALMS and Moodle LMS?

Method

Participants

The subjects were college students from a state university's Faculty of Education. All students were given access to the data collecting tool through the LMS, and participation was voluntary. College students from 13 departments participated in the current study; of the 146 participants, 102 were females (69.9%) and 44 were males (30.1%). The age of the participants ranged from 18 to 33 years, with an average age of 21.66 (SD = 2.61). Being an experienced user of both ALMS and Moodle LMS was a criterion for inclusion in the current study.

Data Collection Tools

An online questionnaire was used to collect data. This questionnaire contained demographic profile items, the Learning Management Systems Evaluation Scale -LMSES (Barut Tuğtekin, 2021), and the Online Examination Assessment Scale - OEAS (Yilmaz, 2016). LMSES consisted of 19 items and 3 factors, with a 5-point Likert scale ranging from (1) *strongly disagree* to (5) *completely agree*. Because the LMSES had one reversed item, it was reverse scored for this study. According to the original form of the LMSES, the explained variances of the factors were 23.06% for dialogue, 25.74% for structure,

and 14.93% for autonomy. The fit indices obtained from the LMSES (structure = 0.9, dialogue = 0.89, autonomy = 0.82; $\chi^2 = 252.78$, $df = 146$, $\chi^2/df = 1.73$; CFI = 0.95, NFI = 0.90, GFI = 0.89, AGFI = 0.85; SRMR = 0.06, RMSEA = 0.06; $p < 0.001$), and Cronbach's Alpha (α) reliability coefficients were at an acceptable bound (i.e., α > .70). The OEAS had 3 factors and 17 items, with a 5-point Likert scale ranging from (1) *strongly disagree* to (5) *completely agree*. Because the OEAS contained six reversed items, these items were reverse scored and included in the ongoing analyses. According to the original form of the OEAS, the practicality-suitability factor explained 36% of the variance, the affective factors about 17%, and the reliability factor approximately 9%. Cronbach's alpha reliability coefficients for factors were found to be (α= 0.89) for practicality-suitability, (α = 0.82) for affective, and (α = 0.82) for reliability.

Confirmatory Factor Analysis (CFA) was conducted to test the suitability of the data collection instruments with the sample for this study. The model fit indices of the LMSES were found to be in the good-fit value range ($\chi^2 = 270.881$, $df = 147$, $\chi^2/df = 1.84$; CFI = 0.92, NFI = 0.84, GFI = 0.85, AGFI = 0.80; SRMR = 0.06, RMSEA = 0.07; $p < 0.001$). For the LMSES, Cronbach's alpha reliability coefficient was found to be (α=0.93). The measurement model was also confirmed, with good fit indices ($\chi^2 = 243.377$, $df = 115$, $\chi^2/df = 2.116$; CFI = 0.93, NFI = 0.87, GFI = 0.85, AGFI = 0.80; SRMR = 0.06, RMSEA = 0.08; $p < 0.001$), based on the findings of CFA. For the OEAS, Cronbach's alpha reliability coefficient was also found to be (α = 0.93). Therefore, the scales used in the current research constituted a valid and reliable measurement model, and there were no violations.

Procedure

Moodle, ALMS, Canvas, and Blackboard are popular LMS and are often used in the region where the research was done. Both Moodle and Canvas are open source and free to use, while ALMS and Blackboard are commercial LMS with annual fees. Although Blackboard has been used throughout the world, ALMS was developed in Turkey by Advancity. It has become one of the most popular LMS there, even though it is not used extensively worldwide. Moodle has been used in over 70 higher education institutions, and ALMS has been used in close to 60 higher education institutions when comparing the most popular LMS in Turkey (Cabi & Ersoy, 2022; Karadag et al., 2021; Yolsal & Yorulmaz, 2022). This study examined the use of Moodle LMS and ALMS, among the most frequently used LMS in the region. Table 1 compares some notable characteristics and attributions of the Moodle LMS and ALMS as used in the current research.

Table 1

Comparing ALMS and Moodle LMS Features and Attributes

Feature	Moodle	ALMS
Virtual classroom plugin	Google Classroom integrated	Perculus Plus integrated
Storage space	On Google Drive	On internal virtual server
Mobile application	Yes	No (Web environment adapted for mobile access)
Page	Yes	Yes
URL	Yes	Yes

File	Yes	Yes
Lecture	Yes	Yes
Lesson plan	Yes	Yes
Discussion/Forum	Yes	Yes
Chat	Yes	No
Reports	Yes	Yes
Comments	Yes	No
Blogs	Yes	No
Survey	Yes	Yes
Quick mail	Yes	Yes
Task	Yes	Yes
Group mode	Yes	No
Wiki	Yes	No
Calendar	Yes	Yes
Statistics	Yes	Yes
Role settings	Yes	Yes
Homework	Yes	Yes
Change course visibility	Yes	Yes
Tests	Yes	Yes
Online exam	Yes	Yes
Synchronous & asynchronous exams	Yes	Yes
Exam types	Various	Various
Online exam proctoring	No	No
Video	Yes	Yes
Interactive video	Plugin can be installed	Yes
Dictionary	Plugin can be installed	Yes
Language adjustment	Plugin can be installed	Yes
LTI activity	Plugin can be installed	Yes
Grade chart	Plugin can be installed	Yes
Send feedback	Plugin can be installed	Yes

Since this research assessed two distinct LMS (i.e., ALMS and Moodle LMS) according to the Transactional Distance Theory and the evaluation of online test procedures, it was crucial to identify learners who had experienced both LMS. First, an online data collecting tool was made available to Faculty of Education students who were taking courses via ALMS during the spring semester of 2020–2021. This online survey collected the participants' nicknames and e-mail addresses only, with no direct request for any other identification information. The goal was to select the same participants who also

took part in the subsequent Moodle LMS implementation. In the second stage of the study, college students from the Faculty of Education who also studied through Moodle LMS in the fall semester of 2021–2022 were offered an online questionnaire to evaluate Moodle at the end of the semester. As with the previous implementation, the participants' nicknames and e-mail addresses were gathered, and their participation status in former ALMS sessions was also checked and verified. Following the second implementation, one-to-one comparisons of nicknames and e-mail addresses were performed, and the learners who participated in both implementations were determined. These individuals comprised the sample for this study. Figure 1 depicts the complete research procedure.

Figure 1

Research Procedure

Data Analysis

Prior to performing the data analysis, skewness and kurtosis values were found to be ±1 (Hair et al., 2013), and a total of eight participants, found to be outliers in Mahalanobis distance and Q-Q plot graphs, were eliminated from all ongoing analyses (McLachlan, 1999). Since two-way repeated measures were conducted on the same study group in this research, the sphericity assumption was

tested. The results of the analyses showed that the homogeneity of equal variance assumption was not violated, and that Mauchly's test of sphericity significance value was above 0.05 (Cooley & Lohnes, 1971). Once the prerequisites were fulfilled, two-way repeated measures ANOVA was conducted. The average scores for all the scales and factors were calculated and analyzed, and the average scores were interpreted.

Findings

Table 2 presents the average LMSES and OEAS scores of participants for two distinct LMS environments.

Table 2

Descriptive Statistics of ALMS and Moodle LMS for LMSES and OEAS

LMS and scale	Min.	Max.	Sum	Mean	*SE*	*SD*
ALMS LMSES	1.42	5.00	505.32	3.461	.060	.722
Moodle LMSES	2.00	4.95	545.58	3.737	.057	.694
ALMS OEAS	1.24	5.00	438.71	3.005	.071	.857
Moodle OEAS	1.06	5.00	449.53	3.079	.082	.985

When the total mean scores for the scales were compared, the LMSES scores for Moodle LMS (Mean = 3.74; *SD* = 0.69) outperformed the ALMS (Mean = 3.46; *SD* = 0.72). When the OEAS scores used to assess the online tests are compared, the average scores of Moodle LMS and ALMS were quite close.

Table 3 presents the descriptive statistics for ALMS and Moodle LMS regarding LMSES factors based on Transactional Distance Theory.

Table 3

Descriptive Statistics of ALMS and Moodle LMS for LMSES Factors

Factors	Min.	Max.	Sum	Mean	*SE*	*SD*
ALMS structure	1.14	5.00	570.71	3.909	.061	.746
ALMS dialogue	1.25	5.00	424.75	2.909	.073	.879
ALMS autonomy	1.50	5.00	552.00	3.781	.072	.876
Moodle LMS structure	1.57	5.00	566.43	3.880	.065	.784
Moodle LMS dialogue	1.00	5.00	508.13	3.480	.065	.785
Moodle LMS autonomy	1.25	5.00	584.00	4.000	.068	.815

According to Table 3, when the averages of the LMSES factors were examined, autonomy in the Moodle LMS had the greatest average score, and dialogue in ALMS had the lowest. Additionally, structure in ALMS had a higher average score than the other ALMS factors.

Two-factor repeated measures ANOVA was conducted to scrutinize the differences between the LMSES factors for the ALMS and Moodle LMS within the context of the Transactional Distance Theory. The findings are summarized in Table 4.

Table 4

Two-Way Repeated Measures ANOVA Results

Source	*SS*	*df*	*MS*	*F*	*p*	η_p^2	Power
LMS type	14.088	1	14.088	8.982	.003*	.058	.845
Error (LMS type)	227.425	145	1.568				
LMSES factor	94.733	2	47.367	187.04	.000**	.563	1.000
Error (LMSES factor)	73.441	290	.253				
LMS type * LMSES factor	13.288	2	6.644	29.218	.000**	.168	1.000
Error (interaction)	65.946	290	.227				
Total error	212.013	145	1.462				

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

Based on the differences between the LMS type variable across the groups, findings in Table 4 revealed a significant result ($F_{(1\text{-}145)} = 8.982$; $p < 0.01$; $\eta_p^2 = 0.058$). Additionally, the statistical power value was found to be 0.845. There were found to be statistically significant differences between the groups in the analysis of the LMSES factors ($F_{(2\text{-}290)} = 187.040$; $p < 0.001$; $\eta_p^2 = 0.563$). As well, it was revealed that there was a statistically significant difference in the interaction of the LMS type and LMSES factors ($F_{(2\text{-}290)} = 29.218$; $p < 0.001$; $\eta_p^2 = 0.168$). The power value of this result was found to be 1.00. Figure 2 depicts the variations of LMSES factors based on LMS type.

Figure 2

Changes in LMSES Factors According to LMS Type

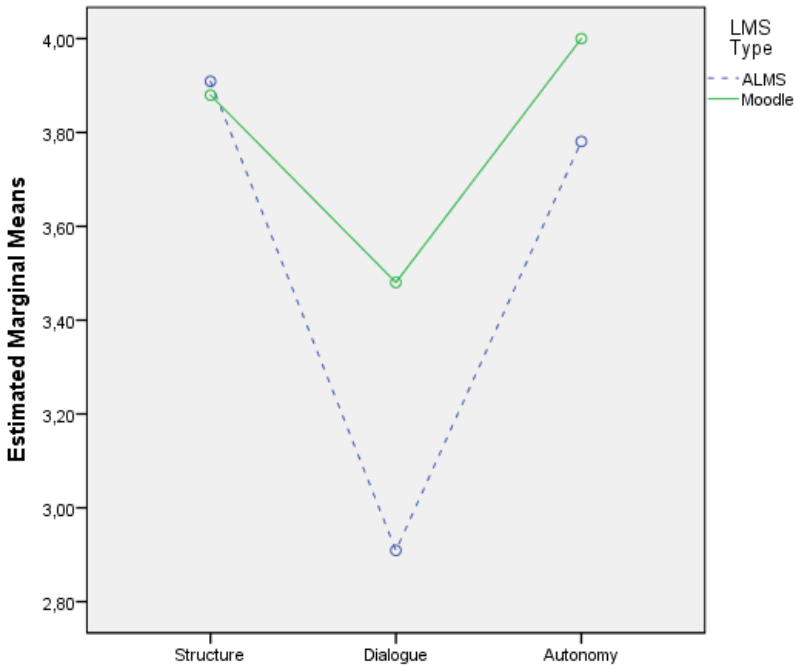


Figure 2 shows that the dialogue factor, for which Moodle had a higher mean score, was where the two LMS differed most significantly. On the other hand, both LMS scored similarly on the structure factor. To ascertain which LMSES factors varied in statistical significance, a straightforward main effect analysis was used and paired-samples t-tests were conducted. The results are shown in Table 5.

Table 5

t-Test Results for LMSES Factors

Factor	Mean	*SD*	*t*	*df*	$p <$	η^2
ALMS–Moodle LMS (structure)	.029	1.039	.341	145	.733	0.001
ALMS–Moodle LMS (dialogue)	-.571	1.239	-5.570	145	.000**	0.176
ALMS–Moodle LMS (autonomy)	-.219	1.197	-2.213	145	.028*	0.033

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

There was a significant difference between LMS in terms of dialogue ($t_{(145)} = -5.570$; $p < 0.001$) and autonomy ($t_{(145)} = -2.213$; $p < 0.05$), both of which are factors of LMSES. Since the value calculated for the dialogue factor was larger than 0.14, it suggested a large effect size, and since the value computed for the autonomy factor was less than 0.06, it indicated a small effect size (Cohen, 1988).

Table 6 presents the descriptive statistics of ALMS and Moodle LMS for OEAS variables, whereby online exams made in the two distinct LMS types were compared.

Table 6

Descriptive Statistics for Online Exams Via Distinct LMS

Factor	Min.	Max.	Sum	Mean	*SE*	*SD*
ALMS practicality–suitability	1.00	5.00	429.75	2.943	.090	1.094
ALMS affective	1.00	5.00	435.50	2.983	.079	.951
ALMS reliability	1.00	5.00	469.00	3.212	.076	.925
Moodle LMS practicality–suitability	1.00	5.00	443.38	3.037	.099	1.200
Moodle LMS affective	1.00	5.00	441.67	3.025	.092	1.115
Moodle LMS reliability	1.00	5.00	481.67	3.299	.082	.989

When the averages of the OEAS factors in Table 6 were evaluated, it was revealed that the reliability factor for Moodle LMS had the higher score, while the ALMS usability factor had the lowest.

A two-factor repeated measures ANOVA was conducted to assess OEAS factors to measure differences in online exams based on the type of LMS (i.e., ALMS and Moodle LMS). The findings are presented in Table 7. Prior to the related analysis, the prerequisites were checked, and the sphericity assumption was not violated.

Table 7

ANOVA Results for Interactions of LMS Types and Online Exam Factors

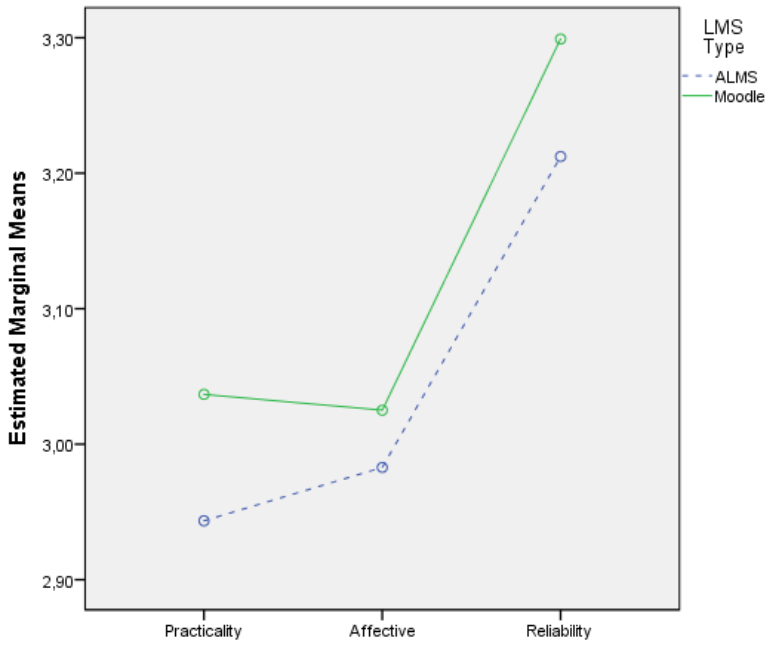
Source	*SS*	*df*	*MS*	*F*	*p*	η_p^2	Power
LMS type	1.203	1	1.203	.474	.492	.003	.105
Error (LMS type)	368.056	145	2.538				
OEAS factor	13.049	2	6.525	12.257	.000*	.078	.996
Error (OEAS factor)	154.370	290	.532				
LMS type * OEAS factor	.113	2	.056	.114	.892	.001	.067
Error (LMS type * OEAS factor)	142.876	290	.493				
Total error	293.904	145	2.027				

Note. * p <0.001.

According to Table 7, the difference in terms of the LMS type variable was not statistically significant, however, there was a statistically significant difference between groups in the analysis of the OEAS factors ($F_{(2\text{-}290)} = 12.257$; $p < 0.001$; $\eta_p^2 = 0.996$). It was determined that there was no statistically significant difference while evaluating the related outcomes for the interactions of the LMS type and OEAS factors ($F_{(2\text{-}290)} = 0.114$; $p > 0.05$; $\eta_p^2 = 0.001$). However, Figure 3 illustrates the variations in OEAS by LMS type.

Figure 3

Average Online Exam Scores for OEAS Factors by LMS Type



As seen in Figure 3, the higher difference between the two distinct LMS is in the usability factor, with Moodle LMS scoring better. When the mean scores of the OEAS factors were examined, the higher means were found in the reliability factor. Furthermore, Moodle LMS had higher average OEAS scores

than ALMS in each factor. In brief, even if there was no statistically significant difference ($F_{(2\text{-}290)} = 0.114$; $p > 0.05$; $\eta_p^2 = 0.001$), Moodle LMS had higher average scores in online exam evaluation than did ALMS.

Discussion

Although there are many different approaches to implementing e-learning, LMS are one of the most effective platforms for carrying out educational activities efficiently, effectively, and systematically. Because of this, educational institutions look for a LMS that can satisfy their e-learning requirements. There are two main options when choosing an LMS to address institutional needs. One is an open source LMS, while the other is a pay-for-use LMS that has been commercially developed. Open source LMS are free-to-use and may be customized to meet an institution's demands, but these come with a range of maintenance and development costs. While the costs of acquiring commercial LMS are substantial, such systems have been designed expressly for the institution and might be simpler to use. Therefore, when deciding between free-to-use and commercial LMS, it is essential to evaluate (a) the institution's demands; (b) LMS ease of use, as well as features that improve and support satisfaction, and (c) the potential resources necessary for LMS implementation (Kasim & Khalid, 2016). Participants in this study used both open source free-to-use Moodle LMS, and the commercial ALMS at different time periods. Comparisons were made between the two alternative LMS. Both Moodle LMS and ALMS were linked to other systems in the institution were fully ready to use.

The usefulness, efficiency, and usability of LMS can be affected by various factors. According to research on ALMS, usability, intention to use, and satisfaction levels have been directly influenced by the quality of the course material and user interface design (Yoruk et al., 2020). According to Alshurideh et al. (2021), the perceived usability and utility of e-learning systems have been significantly influenced by the quality of the content. Since this study examined two distinct kinds of LMS, it is possible that their particular interface designs led to differences in the LMS rating scores. Learners' use of particular LMS during different education terms may have resulted in a range of quality levels in the presentation of instructional information in various courses.

When LMSES scores were considered, the average for Moodle LMS was higher than for ALMS. As a result, it can be argued that Moodle LMS is a more practical and efficient LMS option than ALMS. When the interactions of the LMSES factors were examined while taking into consideration the different LMS types, there was no statistically significant difference in the structure factor of the LMSES, but there was a significant difference in the dialogue and autonomy factors. Additionally, as compared to ALMS, the Moodle LMS revealed a positive and statistically significant difference in the autonomy and dialogue factors. Thus, it may be claimed that Moodle LMS encourages learners to act more independently and that ALMS has a poorer capacity for dialogue. On the other hand, the fact that the structure factor of ALMS had a higher average score than did the other factors, indicates that the ALMS interface was well structured. In addition, course format affects learners' autonomy, as well as learner-learner and learner-instructor communication (Abuhassna et al., 2022). When analyzing how LMS features encourage learners to act independently and participate in dialogue, it is important to consider the ways that instructors use these activities and how frequently. As well, even though learners' autonomy is seen as a crucial notion in e-learning environments (Castañeda & Selwyn, 2018), the use of educational technologies that reinforce learners' autonomy may trigger learner-centered research (Lazorak et al.,

2021). Although the structural elements of LMS (i.e., interface and curriculum) were evaluated using Transactional Distance Theory, the methods and activities employed by instructors in relation to autonomy and dialogue factors can also play an essential role. Therefore, to improve autonomy and dialogue in the successful use of an LMS and manage structural aspects, the LMS interface, features, and ease of use, as well as instructional materials, coursework, and related instructional activities should be scrutinized.

Moodle LMS and ALMS had similar average scores in the overall comparison of online exams. When the OEAS factors for online exams used in LMS were assessed, the reliability factor of Moodle LMS had the highest average score, while the practically-suitability factor of ALMS had the lowest average score. However, there was no statistically significant interaction between LMS type and OEAS factors in online exam evaluation. There was no statistically significant difference between online exams according to the type of LMS employed and the OEAS factors with which the online exam procedures were evaluated. Even with no statistically significant difference, Moodle LMS outperformed ALMS in terms of average scores for each OEAS factor in the assessment of online exams. The average score for the reliability factor of both LMS was relatively higher in comparison to the other factors when Moodle and ALMS were compared using the framework of practically-suitability, affective factors, and reliability. However, because the structural relevance of the online exam questions is measured by the reliability factor of the OEAS, it may be concluded that instructors typically provide trustworthy online exam items.

On the other hand, the fact that both LMS platforms offer unsupervised online exams, and that most instructors favor multiple-choice exams, may have led to comparable experiences for learners during the online exam procedures. Online tests may be associated with a variety of security issues; it is recommended that they be used for formative rather than summative evaluation to ensure that assessments are accurate, dependable, and adaptable when used in distance learning (Shraim, 2019). Considering the security issues with online examinations, formative evaluation targeted at enhancing learning may be a better option for online assessment rather than grading with summative assessment. On the other hand, it would be difficult to provide a formative evaluation setting that delivers individual feedback in online exams when there are numerous participants (Ilgaz & Adanir, 2020). Furthermore, system quality has been cited as the most fundamental component influencing online exams, e-learning experience, mobile learning, and cloud services (Akar & Mardikyan, 2014). Therefore, improved system quality is likely to boost both LMS use and intentions to use (Alshurideh et al., 2021; Liu et al., 2010). As Dermo (2009) has indicated from learners' assessment of online exams, it is crucial to improve exam procedures by addressing affective factors, validity, practical issues, reliability, security, as well as learning and teaching considerations.

Limitations

There were some limitations to this study that should be noted when interpreting the research findings. First, this study was limited to evaluating college students' use of ALMS and Moodle LMS for a semester each. Second, since the institution managed the sequence in which the LMS used in this study were implemented, the inability to alter this sequence should be regarded as one of the crucial limitations. Third, while the data instruments used in the LMS comparisons were validated, they were limited to LMSES and OEAS scales. Fourth, it was expected that instructors used LMS systems efficiently while creating and delivering online exams and related course materials. As well, was assumed that learners had a sufficient degree of expertise using the LMS since the institution provided user guides and support

services. Finally, although participation in the LMS surveys was entirely optional, it was assumed that respondents provided honest evaluations.

Conclusion and Practical Implications

In the current study, the use of two LMS in the e-learning process was scrutinized using the time series approach and within the context of Transactional Distance Theory. Additionally, the effectiveness of online exam procedures in each LMS was assessed. The research findings indicated that online exams in Moodle LMS and ALMS both had similar assessment ratings, while Moodle had a higher evaluation score for the e-learning process. The findings obtained from the Transactional Distance Theory factors indicated that, despite ALMS's structural aspects being predominant, Moodle's strength was mostly tied to learners' autonomy. It was revealed that when evaluated according to the LMSES factors, average scores of the dialogue and autonomy factors of Moodle LMS were significantly higher than for ALMS. The reliability of both LMS was found to be a better indicator than other factors in comparing LMS online exams, where it was found that there was no statistically significant difference between ALMS and Moodle LMS.

We recommend that in selecting and using LMS, choices should be based on their specific characteristics in accordance with the demands of the institutions. Additionally, we believe that LMS may be used more effectively when e-learning instructors are offered specific training to improve their abilities to use LMS. However, we think that results are comparable when tests are given online in an unsupervised setting and are typically of a similar kind. Therefore, we recommend doing empirical comparisons of online exams in e-learning environments for various exam types (e.g., supervised vs. unsupervised, multiple choice vs. open-ended).

References

Abuhassna, H., Busalim, A. H., Mamman, B., Yahaya, N., Zakaria, M., Al-Maatouk, Q., & Awae, F. (2022). From student's experience: Does e-learning course structure influenced by learner's prior experience, background knowledge, autonomy, and dialogue. *Contemporary Educational Technology*, *14*(1), ep338. https://doi.org/10.30935/cedtech/11386

Akar, E., & Mardikyan, S. (2014). Analyzing factors affecting users' behavior intention to use social media: Twitter case. *International Journal of Business and Social Science, 5*(11), 85–95. http://ijbssnet.com/view.php?u=https://www.ijbssnet.com/journals/Vol_5_No_11_1_October_2014/9.pdf

Al-Fraihat, D., Joy, M., Masa'deh, R., & Sinclair, J. (2020). Evaluating e-learning systems success: An empirical study. *Computers in Human Behavior, 102*(1), 67–86. https://doi.org/10.1016/j.chb.2019.08.004

Alshurideh, M. T., Al Kurdi, B., AlHamad, A. Q., Salloum, S. A., Alkurdi, S., Dehghan, A., Abuhashesh, M., & Masa'deh, R. E. (2021). Factors affecting the use of smart mobile examination platforms by universities' postgraduate students during the COVID-19 pandemic: An empirical study. *Informatics, 8*(2), 32. https://doi.org/10.3390/informatics8020032

Arnò, S., Galassi, A., Tommasi, M., Saggino, A., & Vittorini, P. (2021). State-of-the-art of commercial proctoring systems and their use in academic online exams. *International Journal of Distance Education Technologies, 19*(2), 55–76. https://doi.org/10.4018/IJDET.20210401.oa3

Arora, S., Chaudhary, P., & Singh, R. K. (2021). Impact of coronavirus and online exam anxiety on self-efficacy: The moderating role of coping strategy. *Interactive Technology and Smart Education*, *18*(3), 475–492. https://doi.org/10.1108/ITSE-08-2020-0158

Barut Tuğtekin, E. (2021). Development of the learning management systems evaluation scale based on transactional distance theory. *Journal of Educational Technology and Online Learning*, *4*(3), 503-515. https://doi.org/10.31681/jetol.943335

Baxto da Silva, W., Amaro, R., & Mattar, J. (2019). Distance education and the Open University of Brazil: History, structure, and challenges. *International Review of Research in Open and Distributed Learning, 20*(4), 99–115. https://doi.org/10.19173/irrodl.v20i4.4132

Bradley, V. M. (2021). Learning management system (LMS) use with online instruction. *International Journal of Technology in Education, 4*(1), 68–92. https://doi.org/10.46328/ijte.36

Cabi, E., & Ersoy, H. (2021). Technologies used in distance education during the COVID-19 global pandemic and investigation of the opinions of teachers: The case of Baskent University. *Journal of Higher Education and Science, 12*(1), 168–179.

Castañeda, L., & Selwyn, N. (2018). More than tools? Making sense of the ongoing digitizations of higher education. *International Journal of Educational Technology in Higher Education, 15*(1), 1–10. https://doi.org/10.1186/s41239-018-0109-y

Cohen, J. (1988). *Statistical power analysis for the behavioural sciences*. Earlbaum. https://doi.org/10.4324/9780203771587

Cooley, W. W., & Lohnes, P. R. (1971). *Multivariate data analysis*. Wiley. https://doi.org/10.1002/bimj.19730150413

Dadashzadeh, M. (2021). The online examination dilemma: To proctor or not to proctor? *Journal of Instructional Pedagogies*, *25,* 1–11. https://eric.ed.gov/?id=EJ1294386

Dermo, J. (2009). e-Assessment and the student learning experience: A survey of student perceptions of e-assessment. *British Journal of Educational Technology, 40*(2), 203–214. https://doi.org/10.1111/j.1467-8535.2008.00915.x

Dias, S. B., & Diniz, J. A. (2014). Towards an enhanced learning in higher education incorporating distinct learner's profiles. *Educational Technology & Society, 17*(1), 307–319. https://www.jstor.org/stable/10.2307/jeductechsoci.17.1.307

Elfeky, A. I. M., Masadeh, T. S. Y., & Elbyaly, M. Y. H. (2020). Advance organizers in flipped classroom via e-learning management system and the promotion of integrated science process skills. *Thinking Skills and Creativity, 35*, 100622. https://doi.org/10.1016/j.tsc.2019.100622

Hair, J. F., Black, W. C., Babin, B. J., Anderson, R. E., & Tatham, R. L. (2013). *Multivariate data analysis*. Pearson.

Hollister, K. K., & Berenson, M. L. (2009). Proctored versus unproctored online exams: Studying the impact of exam environment on student performance. *Decision Sciences Journal of Innovative Education*, *7*(1), 271–294. https://doi.org/10.1111/j.1540-4609.2008.00220.x

Horzum, M. B. (2011). Developing transactional distance scale and examining transactional distance perception of blended learning students in terms of different variables. *Educational Sciences: Theory & Practice, 11*(3), 1571–1587. https://eric.ed.gov/?id=EJ936610

Huang, R. H., Liu, D. J., Tlili, A., Yang, J. F., & Wang, H. H. et al. (2020). *Handbook on facilitating flexible learning during educational disruption: The Chinese experience in maintaining undisrupted learning in COVID-19 outbreak*. Smart Learning Institute of Beijing Normal University. https://iite.unesco.org/wp-content/uploads/2020/03/Handbook-on-Facilitating-Flexible-Learning-in-COVID-19-Outbreak-SLIBNU-V1.2-20200315.pdf

Ilgaz, H., & Adanir, G. A. (2020). Providing online exams for online learners: Does it really matter for them? *Education and Information Technologies*, *25*(2), 1255–1269. https://doi.org/10.1007/s10639-019-10020-6

Jaap, A., Dewar, A., Duncan, C., Fairhurst, K., Hope, D., & Kluth, D. (2021). Effect of remote online exam delivery on student experience and performance in applied knowledge tests. *BMC Medical Education*, *21*(1), 1–7. https://doi.org/10.1186/s12909-021-02521-1

Jia, J., & He, Y. (2021). The design, implementation and pilot application of an intelligent online proctoring system for online exams. *Interactive Technology and Smart Education, 19*(1), 112–120. https://doi.org/10.1108/ITSE-12-2020-0246

Jorczak, R. (2014). Differences in classroom versus online exam performance due to asynchronous discussion. *Online Learning Journal*, *18*(2), 1–9. https://www.learntechlib.org/p/183751/

Jung, S., & Huh, J. H. (2019). An efficient LMS platform and its test bed. *Electronics, 8*(2), 154. https://doi.org/10.3390/electronics8020154

Karadag, E., Ciftci, S. K., Gok, R., Su, A., Ergin-Kocaturk, H., & Ciftci, Ş. S. (2021). Distance education capacities of universities during the COVID-19 pandemic process. *Journal of University Research, 4*(1), 8–22.

Kasim, N. N. M., & Khalid, F. (2016). Choosing the right learning management system (LMS) for the higher education institution context: A systematic review. *International Journal of Emerging Technologies in Learning*, *11*(6), 55–61. http://dx.doi.org/10.3991/ijet.v11i06.5644

Kehrwald, B. A., & Parker, B. (2019). Implementing online learning: Stories from the field. *Journal of University Teaching & Learning Practice, 16*(1), 1. https://doi.org/10.53761/1.16.1.1

Kemp, N., & Grieve, R. (2014). Face-to-face or face-to-screen? Undergraduates' opinions and test performance in classroom vs. online learning. *Frontiers in Psychology, 5*, 1278. https://doi.org/10.3389/fpsyg.2014.01278

Khalaf, K., El-Kishawi, M., Moufti, M. A., & Al Kawas S. (2020). Introducing a comprehensive high-stake online exam to final-year dental students during the COVID-19 pandemic and evaluation of its effectiveness. *Medical Education Online, 25*(1), 1826861. https://doi.org/10.1080/10872981.2020.1826861

Kwon, S., Kim, W., Bae, C., Cho, M., Lee, S., & Dreamson, N. (2021). The identity changes in online learning and teaching: Instructors, learners, and learning management systems. *International Journal of Educational Technology in Higher Education, 18*(1), 1–18. https://doi.org/10.1186/s41239-021-00304-8

Lazorak, O., Belkina, O., & Yaroslavova, E. (2021). Changes in student autonomy via e-learning courses. *International Journal of Emerging Technologies in Learning, 16*(17), 209–225. https://www.learntechlib.org/p/220066/

Liu, Y., Han, S., & Li, H. (2010). Understanding the factors driving m-learning adoption: A literature review. *Campus-Wide Information Systems, 27*, 210–226. https://doi.org/10.1108/10650741011073761

Markets & Markets. (2022). *Learning Management System (LMS) market by component (solutions and services), delivery mode (distance learning, instructor-led training, and blended learning), deployment, user type (academic and corporate), and region (2022–2026).* https://www.marketsandmarkets.com/Market-Reports/learning-management-systems-

market-1266.html?gclid=EAIaIQobChMItKT-oful3QIVjcqyCh1PcwdkEAAYASAAEgIfGvD_BwE

McLachlan, G. J. (1999). Mahalanobis distance. *Resonance, 4*(6), 20–26. https://www.ias.ac.in/article/fulltext/reso/004/06/0020-0026

Moore, M. G. (1993). Theory of transactional distance. In D. Keegan (Ed.), *Theoretical principles of distance education* (pp. 22–38). Routledge. http://www.c3l.uni-oldenburg.de/cde/found/moore93.pdf

Moore, M. G., & Kearsley, G. (1996). *Distance education: A systems view*. Wadsworth Publishing.

Nasser, R., Cherif, M., & Romanowski, M. (2011). Factors that impact the usage of the learning management system in Qatari schools. *The International Review of Research in Open and Distance Learning, 12*(6), 39–62. https://doi.org/10.19173/irrodl.v12i6.985

Oakes, K. (2002). E-learning: LCMS, LMS-They're not just acronyms but powerful systems for learning. *Training & Development, 56*(3), 73–75.

Raza, S. A., Qazi, W., Khan, K. A., & Salam, J. (2020). Social isolation and acceptance of the learning management system (LMS) in the time of COVID-19 pandemic: An expansion of the UTAUT model. *Journal of Educational Computing Research, 59*(2), 1–26. https://doi.org/10.1177/0735633120960421

Research & Markets. (2022). *Learning management system (LMS) global market report 2022: By component, delivery mode, deployment mode, end user, and covering*. https://www.researchandmarkets.com/reports/5522323/learning-management-system-lms-global-market

Shraim, K. (2019). Online examination practices in higher education institutions: Learners' perspectives. *Turkish Online Journal of Distance Education, 20*(4), 185–196. https://doi.org/10.17718/tojde.640588

Stowell, J. R., & Bennett, D. (2010). Effects of online testing on student exam performance and test anxiety. *Journal of Educational Computing Research*, *42*(2), 161–171. https://doi.org/10.2190/EC.42.2.b

Turnbull, D., Chugh, R., & Luck, J. (2019). Learning management systems: An overview. In A. Tatnall (Ed.), *Encyclopedia of education and information technologies (pp. 1-7)*. Springer Nature. https://doi.org/10.1007/978-3-030-10576-1_248

Turnbull, D., Chugh, R., & Luck, J. (2021). The use of case study design in learning management system research: A label of convenience? *International Journal of Qualitative Methods, 20*. https://doi.org/10.1177/16094069211004148

Watson, R., & Watson, S. (2007). An argument for clarity: What are learning management systems, what are they not, and what should they become? *TechTrends, 51*(2), 28–34. https://doi.org/10.1007/s11528-007-0023-y

Weber, J. M., & Lennon, R. (2007). Multi-course comparison of traditional versus Web-based course delivery systems. *Journal of Educators Online, 4*(2), 1–19. https://eric.ed.gov/?id=EJ907748

Woldeab, D., & Brothen, T. (2021). Video surveillance of online exam proctoring: Exam anxiety and student performance. *International Journal of E-Learning & Distance Education, 36*(1), 1–26. https://www.ijede.ca/index.php/jde/article/view/1204/1856

Wood, D., Kurtz-Costes, B., & Copping K. (2011). Gender differences in motivational pathways to college for middle class African-American youths. *American Psychological Association, 47*(4), 961–968. https://doi.org/10.1037/a0023745

Yilmaz, O. (2016). Online examination assessment survey. *e-Kafkas Journal of Educational Research, 3*(3), 26–33. https://dergipark.org.tr/en/pub/kafkasegt/issue/27919/296377

Yolsal, H., & Yorulmaz, O. (2022). The effect of COVID19 pandemic on the performance of higher education students. *Kafkas University Economics and Administrative Sciences Faculty, 13*(25), 441–472. https://doi.org/10.36543/kauiibfd.2022.019

Yoruk, T., Akar, N., & Erdogan, H. (2020). An analysis of the factors affecting use of learning management system in the framework of extended technology acceptance model with structural equation model. *Eskisehir Osmangazi University Journal of Social Sciences, 21*(2), 431–449. https://dergipark.org.tr/en/pub/ogusbd/issue/58568/808336

International **R**eview of **R**esearch in **O**pen and **D**istributed **L**earning
Volume 24, Number 2

May – 2023

Predicting Online Learning Success Based on Learners' Perceptions: The Integration of the Information System Success Model and the Security Triangle Framework

Ahmed Al-Azawei[1], Alharith A. Abdullah[2], Mahmood K. Mohammed[3], and Zaid A. Abod[3]
[1]College of Information Technology, University of Babylon, Hillah, Iraq; [2]University of Babylon, Hillah, Iraq; [3]Al-Qasim Green University, Hillah, Iraq

Abstract

Although online learning has become ubiquitous worldwide, earlier research has neglected the relationship between its actual use and security concerns. Learners' lack of security awareness while using learning technologies remains rarely studied. This paper integrates Delone and McLean's information system success (D&M-ISS) model with the security triangle framework. Data from 2,451 higher education students at different universities and a wide variety of disciplines in Iraq were collected. In addition to the effectiveness of the D&M-ISS factors, the research findings based on the structural equation model suggest that the three constructs of the security triangle framework—namely, confidentiality, integrity, and availability—were significant predictors of students' use of online learning. This research can thus help academic organizations understand factors that can lead to the successful implementation of online learning and learners' security awareness.

Keywords: online learning, Delone and McLean's information system success model, security triangle framework, higher education

Introduction

Online learning refers to the delivery of educational content and the acquisition of new knowledge and information via the Internet. It allows learners to access learning resources and instructional materials without time and place restrictions. People who face time management issues or have job commitments may find online learning to be a perfect learning environment that can meet their individual needs (Solimeno et al., 2008). However, the absence of direct face-to-face interaction is a major drawback of asynchronous learning (Al-Azawei & Lundqvist, 2015). Other factors that can affect the successful implementation of online learning must also be examined.

Earlier literature has investigated factors that can predict the adoption of online learning (Mshali & Al-Azawei, 2022; Zhang et al., 2020), with little attention paid to learners' awareness of security in adopting and using this learning method. However, the adoption of online learning has grown quickly, and this type of learning requires high levels of privacy and confidentiality. According to El-Khatib et al. (2003), the main focus of e-learning systems has been on course design and development; security and privacy requirements have been neglected. Ameen et al. (2020) confirm that a major challenge is that devices that are used for both personal and work activities can cause various security risks.

To this end, the present research aims to investigate features that could lead to successful implementation of online learning and its use. Though several models have been suggested to examine the successful use and implementation of technology, their key focus has been on determinants of intention to use rather than actual use. According to the theory of reasoned action, people's actions are goal-directed in that they consider the effects of such actions before performing them (Ajzen & Fishbein, 1980). This theory suggests that behavioral intention is a key predictor of actual behavior. Other theories have also been based on this notion (e.g., Davis, 1985; Venkatesh et al., 2003; Venkatesh et al., 2012).

This research considers the role of security concerns in predicting online learning use. It is grounded on the information systems success theory proposed by Delone and McLean (2003). This theory accounts for the role of quality (system quality, information quality, and service quality) in predicting technology success, but it does not include the possible effect of security. According to Maqableh et al. (2021), considering security constructs in understanding technology success is crucial. This research, therefore, represents the first attempt to address this limitation and shed light on the importance of security variables in predicting online learning use. Its results add significant contributions to information systems success in the context of online learning.

Related Work and the Proposed Model

E-Learning in Iraq

To support the implementation of e-learning in Iraq, most Iraqi universities started adopting e-learning technologies in 2010 to create a complementary educational system to traditional face-to-face learning (Al-Azawei et al., 2016). Many outstanding projects have been adopted by the Iraqi Ministry of Higher Education to assist the transition to a digital society and support the implementation of e-learning. The project with the United Nations Educational Scientific and Cultural Organisation (UNESCO) is one example of the integration of e-learning systems in Iraqi higher education (Al-Azawei et al., 2016).

However, with the acceleration of e-learning, some security concerns remain about its exposure to various threats.

In Iraq, cyber improvement has been late, and the foundation of a cyber-security procedure has been severely harmed by decades of war. To develop the country's cybersecurity, Iraqi legislators must upgrade and back the infrastructure by enacting cyber laws. There is still little development or awareness of cybersecurity in Iraq, so Iraqi society is vulnerable to cybercrimes.

The Proposed Model

This research is grounded on Delone and McLean's (2003) information systems success (D&M-ISS) model and the security triangle framework (Stallings, 2003). The available information systems frameworks, such as the technology acceptance model, the unified theory of acceptance and use of technology (UTAUT) (Venkatesh et al., 2003), and the D&M-ISS model, have neglected the importance of security in the adoption and/or success of information systems. Accordingly, previous literature has attempted to address this limitation by considering security concerns. For example, Salam and Ali (2020) extended the UTAUT with the three variables of the security triangle framework, namely, confidentiality, integrity, and availability, to investigate cloud computing adoption. These three constructs were proposed as direct predictors of users' behavioral intentions; the findings revealed that perceived availability was the only significant predictor of cloud computing adoption.

Delone and McLean's Information Systems Success Model

In 1992, the first version of Delone and McLean's D&M-ISS model was proposed (Delone & McLean, 1992). It suggests a relationship among six constructs: information quality, system quality, perceived satisfaction, information systems use, user impact, and organizational impact. This model, however, was updated in 2003 with the addition of a new construct: service quality (Delone & McLean, 2003). Previous literature has successfully validated the new model with many applications to information systems (Al-Azawei, 2019; Al-Azawei & Al-Azawi, 2021; Dong et al., 2014).

This model suggests that better system quality can lead to improving system use and user satisfaction, and this, in turn, can enhance users' productivity (Delone & McLean, 2003). Reliability, ease of use, accessibility, and functionality are key identifiers of system quality. Another assumption of this model is that better system objectivity can be achieved with the provision of high-quality information and content. Accordingly, information quality is proposed to influence system use and user satisfaction. This construct can be measured based on information accessibility, accuracy, and timeliness, as well as context and relevancy (Dong et al., 2014). Furthermore, Delone and McLean (2003) suggest that service quality is not a subset of system quality. According to Pitt et al. (1995), service quality refers to the discrepancy between the perceptions of customers and expectations. Thus, service quality in information systems can include the availability of physical facilities, users' ability to perform a particular service dependably, prompt service provision, and support for users if they face any technical issues (Pitt et al., 1995). In higher education, students should be treated as customers; that is, they should be offered high-quality educational services (Al-Adwan et al., 2022).

User satisfaction, on the other hand, covers the perspectives of users about a particular technology or system that could meet their individual information needs (Dong et al., 2014). Behavioral intention is the apparent willingness of users to adopt a particular technology (Alowayr & Al-Azawei, 2021). Delone and McLean (2003) propose that user satisfaction and behavioral intention are associated with actual use. The model assumes that intention to use or behavioral intention and user satisfaction can be highly

influenced by information, system, and service quality (Delone & McLean, 2003). These assumptions have been supported in online and e-learning contexts (Al-Adwan et al., 2021; Al-Adwan et al., 2022; Awad et al., 2022; Çelik & Ayaz, 2022). In this study, the following hypotheses were proposed:

H1: Information quality is a predictor of behavioral intention.

H2: Information quality is a predictor of user satisfaction.

H3: System quality is a predictor of behavioral intention.

H4: System quality is a predictor of user satisfaction.

H5: Service quality is a predictor of behavioral intention.

H6: Service quality is a predictor of user satisfaction.

H7: User satisfaction is a predictor of behavioral intention.

H8: Behavioral intention is a predictor of the actual use of online learning.

H9: User satisfaction is a predictor of the actual use of online learning.

Security Triangle Model

Users perceive the importance of security measures because of the illegal practices of hackers. Such activities could be harmful to their privacy and may reveal their personal information in an unauthorized manner (Maqableh et al., 2021). Hence, the security triangle model, one of the most popular security frameworks, characterizes several criteria that each secure system must meet. Three constructs—namely, confidentiality, integrity, and availability—are considered in the use of information systems (Chaeikar et al., 2012). However, few studies have investigated the effect of these three constructs on behavioral intention to use technology (Salam & Ali, 2020) or attitude toward technology use (Meharia, 2012). Hartono et al. (2013) assumes that these factors are predictors of the actual use of e-commerce. Farooq et al. (2020) have examined the prediction ability of the security construct on students' attitudes to adopt e-learning.

In this research, the security triangle constructs were integrated with the D&M-ISS model to examine online learning use. The rationale behind this integration was that users may not use a particular technology if they feel that their individual information will be obtained by an unauthorized party. This extension represents the key contribution of this study as earlier research paid too much attention to identifying predictors of behavioral intention only (Ajzen & Fishbein, 1980; Davis, 1986). Accordingly, between 30% and 45% of the variance of actual use has previously been explained (Alshurideh et al., 2020; Isaac et al., 2019). This research, therefore, aims at improving the explained variance of online learning's actual use by investigating the effect of the security triangle framework.

Confidentiality. Confidentiality refers to the prevention of unauthorized people from capturing, interpreting, or understanding information (Tsiakis & Sthephanides, 2005). Confidentiality is fulfilled by using a particular approach to change the form of data in a manner so that it is not understandable by an unauthorized party. E-learning security requires the protection of users' information by preventing unauthorized users from reaching a system's information and data. In this research, we

proposed that confidentiality is a direct predictor of online learning's actual use. This is based on the assumption that if learners know that their personal information is accessed by an authorized party, the online learning system will not be used. Hence, the following hypothesis is assumed:

H10: Perceived confidentiality is a predictor of the actual use of online learning.

Integrity. Integrity guarantees that users' information has not been modified in any unapproved manner (Stallings, 2003). The integrity of information should be maintained at its creation, transmission, and storage. Changing information incorporates inclusion, erasure, and substitution breaches. In the e-learning sector, users should ensure the ability to keep their information without any modifications. Moreover, learning contents and other system materials should only be modified by authorized users. At the same time, such resources should be maintained so that no tampering or revision can be done illegally. Accordingly, it was assumed here that illegal modifications, whether on users' personal information or learning content, can negatively affect the actual use of online learning technology.

H11: Perceived integrity is a predictor of the actual use of online learning.

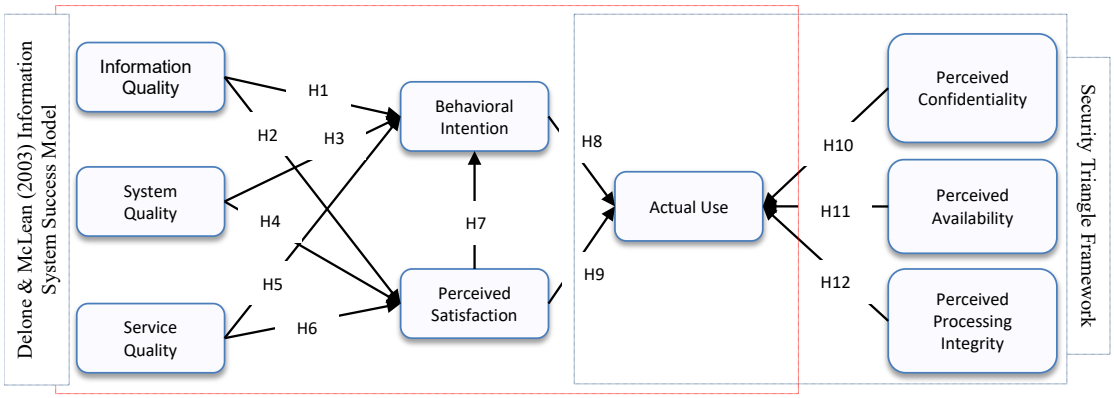
Availability. Availability of information at any time, from any place, and only for authorized people is one of the most important priorities of any system such as an educational platform. Many actions can be performed to ensure information availability. These may include but are not limited to maintaining the operating system's environment, ensuring that a system is free of errors, continuously reviewing a system's updates to avoid interruption of services, and storing backup data to help recover lost data and avoid losing data due to unforeseen incidents. E-learning security requires authorized users' ability to access learning resources at any time. As such, the following hypothesis was assumed:

H12: Perceived availability is a predictor of the actual use of online learning.

Figure 1 depicts the proposed model.

Figure 1

The Proposed Research Model



Research Methods

The Research Design Method and Survey

The quantitative research design method was adopted in this study as it uses a questionnaire approach to collect data. This method was chosen as a suitable technique for understanding the association among the proposed model factors and for supporting or rejecting the research hypotheses. Overall, nine variables were measured using 36 closed-ended questions. In this research, the questionnaire items were adapted from previously validated scales (Al-Azawei, 2019; Al-Azawei & Lundqvist, 2015; Alowayr & Al-Azawei, 2021; Isaac et al., 2019; Meharia, 2012; Ramirez-Correa et al., 2017). However, some items were modified to fit the study's context. All items were designed based on a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree).

Although all items were designed in English, they were translated into Arabic for participants' ease of understanding. The translations were checked by all authors—all speakers of both Arabic and English—to ensure clarity and accuracy. Accordingly, the authors provided individual feedback on the survey, and this in turn led to a few changes made to some questions.

Participants and Context

Educational institutions in Iraq use online learning platforms to deliver learning content and communicate with students. Moodle and Google Classroom have been the most adopted platforms due to their reliability. This research targeted higher education students at public and private universities in Iraq who adopted the online learning approach. Students were from different universities, which were allocated in several governorates from south to north Iraq. Moreover, the respondents were from several different disciplines and departments, including the humanities, sciences, engineering, and medicine.

The authors distributed a link to the questionnaire to lecturers at different universities. They in turn distributed it to their students. Accordingly, the probabilistic random sampling technique was adopted as each higher education student from the selected universities could participate in this research. This is an effective method in quantitative research design: it is commonly linked with survey research techniques, researchers can make inferences from the sample about a whole population, and this technique produces unbiased data (Saunders et al., 2012). Table 1 shows the demographic information of the research participants.

Table 1

Demographic Information of the Research Participants (n = 2,451)

Demographic information	*n*	%
Gender		
- Female	1,374	56.1
- Male	1,077	43.9
Age group		
- 18–20	659	26.9
- 21–23	1,135	46.3
- 24–26	325	13.3
- 27–29	102	4.2
- 30+	230	9.4
Experience with online learning		
- High experience	559	22.8
- Moderate experience	1,892	77.2
Do you have a smartphone or computer?		
- No	194	7.9
- Yes	2,257	92.1
Do you have Internet service either at home or via mobile?		
- No	337	13.7
- Yes	2,114	86.3

Data Collection

The survey was distributed online via social media applications such as Facebook Messenger, Viber, and WhatsApp. Overall, 2,451 valid responses were received. A large sample size can reduce the error rate in generalizing the research findings (Saunders et al., 2012). According to Lowry and Gaskin (2014), the number of cases required for the use of a structural equation model can be identified by two methods. The first is that the smallest sample size can be calculated by 10 multiplied by the largest number of constructs used to predict a particular variable. The other method suggests setting the statistical power of regression at 80% and the probability value of significance at .05. Based on both methods, the sample size used in this research was adequate.

Data Analysis Techniques

The data collected in this research were analyzed using SmartPLS version 3.0 (Ringle et al., 2015) and SPSS version 21. Validating the instrument properties and measuring the cause-and-effect associations among the proposed research model constructs were performed using SmartPLS, whereas frequencies were calculated using SPSS.

Results

Descriptive Statistics

Table 2 shows that the mean scores of the research constructs are higher than the midpoint of 2.5. The standard deviation, on the other hand, ranged from 0.913 to 1.154, indicating that values were moderately spread around the mean. Furthermore, skewness and kurtosis confirmed that data were approximately normally distributed as their values were less than 3 and greater than −3, as recommended by Peat and Barton (2005). As recommended by Pallant (2013), tolerance values were higher than 0.10 and variance inflation factors values were less than 10, confirming that the multicollinearity assumption was supported.

Table 2

Descriptive Statistics

Factor	Min.	Max.	*M*	*SD*	Skewness	Kurtosis	Tolerance	VIF
BI	1.00	5.00	2.795	1.203	0.045	−1.088	0.253	3.950
PS	1.00	5.00	3.026	1.154	−0.225	−0.908	0.228	4.388
IQ	1.00	5.00	2.956	1.112	−0.120	−0.813	0.231	4.338
SQ	1.00	5.00	2.880	1.070	−0.083	−0.752	0.179	5.586
SerQ	1.00	5.00	3.277	1.062	−0.538	−0.334	0.291	3.442
AU	1.00	5.00	3.084	0.974	−0.418	−0.251	0.428	2.336
PC	1.00	5.00	3.303	1.074	−0.627	−0.246	0.428	2.336
PA	1.00	5.00	3.083	1.101	−0.276	−0.736	0.586	1.708
PI	1.00	5.00	3.339	0.913	−0.937	0.884	0.393	2.547

Note. VIF = variance inflation factors; BI = behavioral intention; PS = perceived satisfaction; IQ = information quality; SQ = system quality; SerQ = service quality; AU = actual use; PC = perceived confidentiality; PA = perceived availability; PI = perceived processing integrity

Psychometric Properties of the Research Questionnaire

First, the questionnaire properties were validated. The outer loadings of all items were more than 0.7 (see Appendix A). Moreover, the instrument's reliability was established, as shown in Table 3. Cronbach's coefficient alpha represents a measurement of the reliability of a research questionnaire in which ≥ 0.7 is an acceptable threshold (Pallant, 2013). The questionnaire's convergent validity was confirmed. This can be established if the values of composite reliability and average variance extracted exceed 0.7 and 0.5, respectively (Hair et al., 2006). Finally, discriminant validity was also confirmed as the variance shared between one variable and another construct was less than the variance shared by a variable with its constructs (Fornell & Larcker, 1981). Table 4 presents confirmation of the discriminant validity.

Table 3

Construct Reliability and Validity

Factor	Cronbach's α	Rho_A	Composite reliability	AVE
AU	0.838	0.860	0.893	0.681
BI	0.942	0.942	0.958	0.851
IQ	0.927	0.927	0.945	0.773
PA	0.874	0.883	0.913	0.724
PC	0.938	0.939	0.956	0.843
PI	0.877	0.878	0.916	0.731
PS	0.889	0.892	0.931	0.818
SerQ	0.836	0.839	0.901	0.753
SQ	0.903	0.906	0.928	0.721

Note. AVE = average variance extracted; AU = actual use; BI = behavioral intention; IQ = information quality; PA = perceived availability; PC = perceived confidentiality; PI = perceived processing integrity; PS = perceived satisfaction; SerQ = service quality; SQ = system quality

Table 4

Discriminant Validity (Fornell–Larcker Criterion)

Factor	AU	BI	IQ	PA	PC	PI	PS	SerQ	SQ
AU	0.825								
BI	0.709	0.922							
IQ	0.734	0.761	0.879						
PA	0.513	0.432	0.496	0.851					
PC	0.634	0.532	0.607	0.528	0.918				
PI	0.634	0.515	0.561	0.650	0.687	0.855			
PS	0.721	0.842	0.786	0.453	0.578	0.559	0.904		
SerQ	0.724	0.688	0.751	0.513	0.641	0.637	0.725	0.868	
SQ	0.753	0.781	0.854	0.511	0.650	0.607	0.788	0.814	0.849

Note. AU = actual use; BI = behavioral intention; IQ = information quality; PA = perceived availability; PC = perceived confidentiality; PI = perceived processing integrity; PS = perceived satisfaction; SerQ = service quality; SQ = system quality

Table 5 shows discriminant validity based on the Heterotrait–Monotrait ratio (HTMT). Henseler et al. (2015) state that the HTMT should be < 1, but there is still a debate regarding its exact acceptable threshold. HTMT values may indicate a lack of discriminant validity if they are close to 1 (Ab Hamid et al., 2017). Henseler et al. (2015) state that HTMT values of 0.85 or 0.90 are acceptable. In this research, the HTMT values between system quality and information quality as well as system quality and service quality are about 0.93. This is because the three constructs measure quality from different angles, so there is an obvious correlation among them. Roemer et al. (2021) demonstrate that HTMT may generate biased estimations of the correlations between constructs. According to Rönkkö and Cho (2022, p. 33), "a large correlation does not always mean a discriminant validity problem if one is expected based on theory or prior empirical observations." Thus, the instrument properties are supported.

Table 5

Discriminant Validity (HTMT)

Factor	AU	BI	IQ	PA	PC	PI	PS	SerQ
BI	0.792							
IQ	0.830	0.814						
PA	0.586	0.464	0.540					
PC	0.714	0.566	0.652	0.569				
PI	0.744	0.566	0.624	0.721	0.758			
PS	0.829	0.918	0.865	0.500	0.632	0.633		
SerQ	0.862	0.773	0.851	0.582	0.723	0.743	0.839	
SQ	0.860	0.846	0.931	0.563	0.710	0.684	0.877	0.935

Note. HTMT = Heterotrait–Monotrait ratio; AU = actual use; BI = behavioral intention; IQ = information quality; PA = perceived availability; PC = perceived confidentiality; PI = perceived processing integrity; PS = perceived satisfaction; SerQ = service quality; SQ = system quality

Results of the Original Model

Table 6 and Figure 2 indicate that all original hypotheses of the D&M-ISS model were supported except for H5. The model explained 0.748, 0.679, and 0.557 of the variance of behavioral intention, perceived satisfaction, and actual use, respectively.

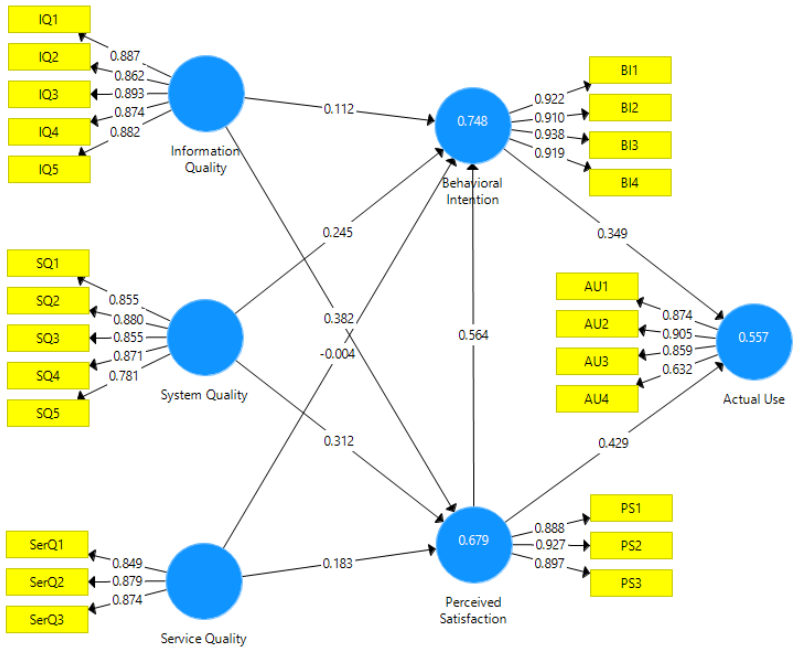
Table 6

Findings Without the Security Triangle Constructs

Hypothesis	β	*t*	*p*	Findings
H1: information quality → behavioral intention	0.112	4.346	< .001	Supported
H2: information quality → perceived satisfaction	0.382	13.908	< .001	Supported
H3: system quality → behavioral intention	0.245	8.814	< .001	Supported
H4: system quality → perceived satisfaction	0.312	9.604	< .001	Supported
H5: service quality → behavioral intention	−0.004	0.222	.824	Rejected
H6: service quality → perceived satisfaction	0.183	7.618	< .001	Supported
H7: perceived satisfaction → behavioral intention	0.564	27.145	< .001	Supported
H8: behavioral intention → actual use	0.349	12.381	< .001	Supported
H9: perceived satisfaction → actual use	0.429	14.653	< .001	Supported

Figure 2

The Model Without the Security Triangle Constructs



Note. IQ = information quality; BI = behavioral intention; SQ = system quality; AU = actual use; PS = perceived satisfaction; SerQ = service quality

Results of the Proposed Model

Table 7 and Figure 3 depict the key findings of the proposed hypotheses. Eleven out of twelve hypotheses were confirmed. The R^2 explained by the independent variables of the proposed model for the three dependent constructs of behavioral intention, perceived satisfaction, and actual use were 0.748, 0.679, and 0.642, respectively.

Three constructs were predictors of behavioral intention: information quality ($\beta_{IQ \rightarrow BI} = 0.112$, $p < .001$), system quality ($\beta_{SQ \rightarrow BI} = 0.245$, $p < .001$), and perceived satisfaction ($\beta_{PS \rightarrow BI} = 0.564$, $p < .001$). Service quality ($\beta_{SerQ \rightarrow BI} = -0.004$, $p = .822$), on the other hand, was not a significant determinant of behavioral intention, whereas information quality ($\beta_{IQ \rightarrow PS} = 0.382$, $p < .001$), service quality ($\beta_{SerQ \rightarrow PS} = 0.183$, $p < .001$), and system quality ($\beta_{SQ \rightarrow PS} = 0.312$, $p < .001$) were determinants of perceived satisfaction.

Behavioral intention ($\beta_{BI \rightarrow AU} = 0.281$, $p < .001$) and perceived satisfaction ($\beta_{PS \rightarrow AU} = 0.249$, $p < .001$) were predictors of actual use. This study also confirms that the key constructs of the security triangle model, namely, perceived confidentiality ($\beta_{PC \rightarrow AU} = 0.180$, $p < .001$), perceived availability ($\beta_{PA \rightarrow AU} = 0.063$, $p = .001$), and perceived processing integrity ($\beta_{PI \rightarrow AU} = 0.186$, $p < .001$), were significant determinants of online learning actual use.

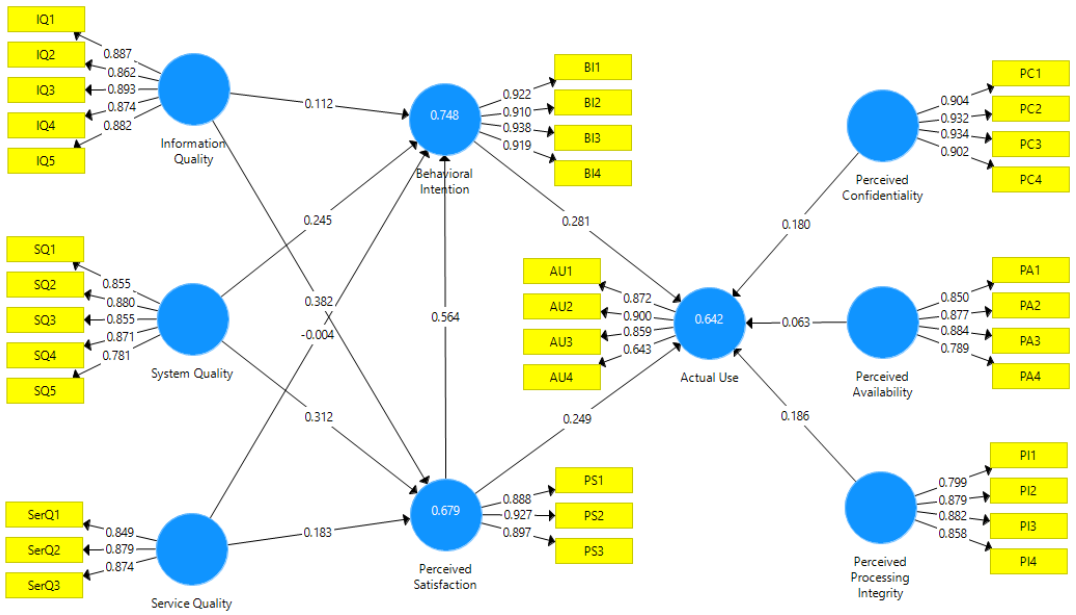
Table 7

The Proposed Research Model Findings

Hypothesis	β	*t*	*p*	Findings
H1: information quality → behavioral intention	0.112	4.338	< .001	Supported
H2: information quality → perceived satisfaction	0.382	13.875	< .001	Supported
H3: system quality → behavioral intention	0.245	8.866	< .001	Supported
H4: system quality → perceived satisfaction	0.312	9.485	< .001	Supported
H5: service quality → behavioral intention	−0.004	0.225	.822	Rejected
H6: service quality → perceived satisfaction	0.183	7.534	< .001	Supported
H7: perceived satisfaction → behavioral intention	0.564	26.876	< .001	Supported
H8: behavioral intention → actual use	0.281	10.991	< .001	Supported
H9: perceived satisfaction → actual use	0.249	8.789	< .001	Supported
H10: perceived confidentiality → actual use	0.180	8.073	< .001	Supported
H11: perceived availability → actual use	0.063	3.477	< .01	Supported
H12: perceived processing integrity → actual use	0.186	7.682	< .001	Supported

Figure 3

The Proposed Research Model Findings



Note. IQ = information quality; BI = behavioral intention; PC = perceived confidentiality; SQ = system quality; AU = actual use; PA = perceived availability; SerQ = service quality; PS = perceived satisfaction; PI = perceived processing integrity

Discussion

This study sought to investigate the effect of security triangle variables on the actual use of online learning. The modified model (Figure 3) was compared with the original model (Figure 2) in terms of the change in R^2 for actual use. This modification shows that the integration of the three security triangle constructs helps improve the explanation of the variance of online learning actual use from 0.557 in the original model to 0.642 in the modified model.

Information quality was a significant predictor of behavioral intention and student satisfaction to support the findings of other studies (Al-Azawei, 2019; Al-shargabi et al., 2021; Ramirez-Correa et al., 2017; Shim & Sug Jo, 2020). This means that the quality of the provided information on e-learning technology has a direct and significant effect on technology acceptance and user satisfaction. As information quality consists of information accessibility, accuracy, timeliness, and relevancy (Dong et al., 2014), the research findings suggest that the system's available information was of a high standard and quality. This may also indicate that the information provided by the online learning system was very informative.

The effect of system quality on user satisfaction and technology adoption was also supported in this research. On the other hand, Shim and Sug Jo (2020) suggest that in their study, system quality was a determinant of neither behavioral intention nor perceived satisfaction of e-learning technology. In our research, however, the investigated educational technology had standard features such as reliability, accessibility, and usability. Reliability refers to the existence of a system that users can use to achieve their needs without too many technical problems or malfunctions. As mentioned, Iraqi higher education institutions have implemented either Moodle or Google Classroom as learning management systems. Both have high-quality maintenance, improvement, and upkeep. Moreover, the educational technologies used were accessible from any location and at any time as universities have either used their own servers or relied on Google Classroom servers, which provide more reliability and service stability. Usability refers to the ease of performing educational tasks or communicating effectively on the university learning management systems (Shim & Sug Jo, 2020). The adopted learning technologies were usable as students used them for at least four months before collecting the research data. This is more apparent in Google Classroom as it has high usability standards (Harefa, 2020).

In online learning, service quality means learners' perceptions of who will provide technical support and to perform a service dependably. In this research, service quality had a significant effect on user satisfaction, but it was not a predictor of behavioral intention. Previous research shows contradictory findings (Petter & McLean, 2009; Ramirez-Correa et al., 2017). The rationale for our results is that students were willing to use online learning, so they were not too concerned about technical support. However, their satisfaction with online learning could be enhanced if they know who is available to address their technical issues.

The research findings indicated that behavioral intention, perceived satisfaction, perceived confidentiality, perceived availability, and perceived processing integrity were significant determinants

of actual use of online learning. In agreement with the D&M-ISS model assumptions (Delone & McLean, 2003), both behavioral intention and perceived satisfaction were determinants of actual use. This indicates that students may not use educational technology when their willingness to adopt it is low. On the contrary, Zhang et al.'s (2020) empirical analyses suggest that behavioral intention did not significantly affect actual e-learning use. This was interpreted to be based on two possible reasons. The former is that students can find important learning content on different Websites and are not limited to their institution's system. The latter is that regardless of their individual willingness, students had to use the university's system as a part of their courses. However, students' dissatisfaction with technology indicates that they are not pleased with its services and it does not meet their needs (Cidral et al., 2020).

This research suggests that the three factors of the security triangle model are predictors of students' actual use of online learning. The cause-and-effect associations between these constructs have been empirically validated. To the best of our knowledge, this has not been investigated in earlier literature. Although these hypotheses have been newly suggested in this research, our overall findings are consistent with those of previous research on e-learning (Farooq et al., 2020), cloud computing adoption (Salam & Ali, 2020), and e-commerce use (Hartono et al., 2013). Our results indicate that hiding students' information from unauthorized entities (i.e., confidentiality) was a determinant of actual use of online learning. Integrity in online learning means guaranteeing that students' information or learning content will not be changed or modified without their permission. Our assumption is that illegal changes made to either students' personal information or learning content can lead to students not using online learning. Our empirical results also confirm that the learning platforms used were available to students because they were maintained regularly, reviewed and updated continuously, and free of errors.

Information quality, system quality, and service quality explained 74.8% and 67.9% of the variance of behavioral intention and perceived satisfaction of online learning success, respectively. This should encourage further focus on all aspects of quality to ensure the successful implementation of such technologies. This research confirms that the quality of online systems, learning content, and services had a significant impact on online learning success, whether in the form of learners' intention to use or learners' satisfaction. Moreover, the security triangle factors' significant influence on actual use of online learning means that security concerns cannot be neglected in considering a technology's success. Students therefore might attribute their success in online learning use to the level of security that the system provides.

Finally, a strength of this study is its inclusion of students from public and private universities, several different governorates, and a wide range of disciplines, reflecting a broad spectrum of Iraqi higher education students. Thus, this study extends the current understanding of online learning usage and success among higher education students by confirming the critical role of security awareness in technology use.

We can draw some practical outcomes from these implications. Higher education institutions need to pay more attention to learning technologies to choose high-quality systems. Learning content should also be updated frequently. The educational content must be in harmony with scientific development and new research discoveries so students feel that they are not left behind. Additionally, technical support should be provided to address any issues students may face with technology. Higher education institutions should also consider security concerns as students are less likely to use technology with possible security risks such as theft or alteration to their personal information. Notably, online learning

systems include exam questions and students' grades, so high security is essential for such systems. Therefore, system managers need to maintain learners' privacy to increase their levels of actual use of online learning. This can include protecting learners' private information and prohibiting unauthorized information disclosures.

Conclusion

This study aimed to integrate the security triangle variables (Stallings, 2003) with the D&M-ISS model (Delone & McLean, 2003) to understand their role in predicting the actual use of online learning. Overall, the research showed good results where the variance explained of the dependent constructs was 74.8%, 67.9%, and 64.2% of behavioral intention, perceived satisfaction, and actual use of online learning, respectively. This research was a step in a new direction in identifying factors that may affect the actual use of technology.

Although many significant outcomes were drawn, the research is not without limitations. First, the sample was from Iraq's higher education only, so further research could be conducted in other countries. Second, this study was grounded on the D&M-ISS model, whereas incorporating other technology success theories and security variables may explain the rest of the dependent variables' variance that was not predicted in this research. Third, this study considered the perceptions of students only, whereas accounting for the perceptions of academic staff is a substantial part of the successful implementation of learning technology. Fourth, although the translation of the research questionnaire was checked by experts, back translation was not conducted. Finally, the analysis was based on structural equation modeling, while building a classification model may open the door for further analysis. Such limitations may invite further research to be conducted.

References

Ab Hamid, M. R., Sami, W., & Mohmad Sidek, M. H. (2017). Discriminant validity assessment: Use of Fornell & Larcker criterion versus HTMT criterion. *Journal of Physics: Conference Series*, *890*(1), Article 012163. https://doi.org/10.1088/1742-6596/890/1/012163

Ajzen, I., & Fishbein, M. (1980). *Understanding attitudes and predicting social behaviour*. Prentice Hall.

Al-Adwan, A. S., Albelbisi, N. A., Hujran, O., Al-Rahmi, W. M., & Alkhalifah, A. (2021). Developing a holistic success model for sustainable e-learning: A structural equation modeling approach. *Sustainability*, *13*(16), Article 9453. https://doi.org/10.3390/su13169453

Al-Adwan, A. S., Nofal, M., Akram, H., Albelbisi, N. A., & Al-Okaily, M. (2022). Towards a sustainable adoption of e-learning systems: The role of self-directed learning. *Journal of Information Technology Education: Research*, *21*, 245–267. https://doi.org/10.28945/4980

Al-Azawei, A. (2019). What drives successful social media in education and e-learning? A comparative study on Facebook and Moodle. *Journal of Information Technology Education: Research*, *18*, 253–274. https://doi.org/10.28945/4360

Al-Azawei, A., & Al-Azawi, R. (2021). Evaluating Facebook success in Iraq: An extension of the DeLone and McLean's model of information systems success (ISS). *Journal of Physics: Conference Series*, *1804*, Article 012114. https://doi.org/10.1088/1742-6596/1804/1/012114

Al-Azawei, A., & Lundqvist, K. (2015). Learner differences in perceived satisfaction of an online learning: An extension to the technology acceptance model in an Arabic sample. *Electronic Journal of E-Learning*, *13*(5), 408–426. https://academic-publishing.org/index.php/ejel/article/view/1942

Al-Azawei, A., Parslow, P., & Lundqvist, K. (2016). Barriers and opportunities of e-learning implementation in Iraq: A case of public universities. *The International Review of Research in Open and Distance Learning*, *17*(5), 126–146. https://doi.org/10.19173/irrodl.v17i5.2501

Al-shargabi, B., Sabri, O., & Aljawarneh, S. (2021). The adoption of an e-learning system using information systems success model: A case study of Jazan University. *PeerJ Computer Science*, *7*, Article e723. https://doi.org/10.7717/peerj-cs.723

Alowayr, A., & Al-Azawei, A. (2021). Predicting mobile learning acceptance: An integrated model and empirical study based on the perceptions of higher education students. *Australasian Journal of Educational Technology*, *37*(3), 38–55. https://doi.org/10.14742/ajet.6154

Alshurideh, M., Al Kurdi, B., & Salloum, S. A. (2020). Examining the main mobile learning system drivers' effects: A mix empirical examination of both the expectation-confirmation model (ECM) and the technology acceptance model (TAM). *Advances in Intelligent Systems and Computing, 1058*, 406–417.https://doi.org/10.1007/978-3-030-31129-2_37

Ameen, N., Tarhini, A., Shah, M. H., & Madichie, N. (2020). Employees' behavioural intention to smartphone security: A gender-based, cross-national study. *Computers in Human Behavior*,

104, Article 106184. https://doi.org/10.1016/j.chb.2019.106184

Awad, R., Aljaafreh, A., & Salameh, A. (2022). Factors affecting students' continued usage intention of e-learning during COVID-19 pandemic: Extending Delone & Mclean IS success model. *International Journal of Emerging Technologies in Learning*, *17*(10), 120–144. https://doi.org/10.3991/ijet.v17i10.30545

Çelik, K., & Ayaz, A. (2022). Validation of the Delone and McLean information systems success model: A study on student information system. *Education and Information Technologies*, *27*(4), 4709–4727. https://doi.org/10.1007/s10639-021-10798-4

Chaeikar, S., Jafari, M., Taherdoost, H., & Chaei Kar, N. S. (2012). Definitions and criteria of CIA security triangle in electronic voting system. *International Journal of Advanced Computer Science and Information Technology*, *1*(1), 14–23. https://ssrn.com/abstract=2372782

Cidral, W., Aparicio, M., & Oliveira, T. (2020). Students' long-term orientation role in e-learning success: A Brazilian study. *Heliyon*, *6*, Article e05735. https://doi.org/10.1016/j.heliyon.2020.e05735

Davis, F. (1985). *A technology acceptance model for empirically testing new end-user information systems: Theory and results* [PhD Dissertation, Massachusetts Institute of Technology]. http://hdl.handle.net/1721.1/15192

Delone, W. H., & McLean, E. R. (1992). Information systems success: The quest for the dependent variable. *Information Systems Research*, *3*(1), 60–95. https://doi.org/10.1287/isre.3.1.60

Delone, W. H., & McLean, E. R. (2003). The Delone and McLean model of information systems success: A ten-year update. *Journal of Management Information Systems*, *19*(4), 9–30. https://doi.org/10.1080/07421222.2003.11045748

Dong, T. P., Cheng, N. C., & Wu, Y. C. J. (2014). A study of the social networking Website service in digital content industries: The Facebook case in Taiwan. *Computers in Human Behavior*, *30*, 708–714. https://doi.org/10.1016/j.chb.2013.07.037

El-Khatib, K., Korba, L., Xu, Y., & Yee, G. (2003). Privacy and security in e-learning. *International Journal of Distance Education Technologies (IJDET)*, *1*(4), Article 1. https://doi.org/10.4018/jdet.2003100101

Farooq, A., Ahmad, F., Khadam, N., Lorenz, B., & Isoaho, J. (2020). The impact of perceived security on intention to use e-learning among students. In *Proceedings—2020 IEEE 20th International Conference on Advanced Learning Technologies (ICALT)* (pp. 360–364). IEEE Computer Society/Conference Publishing Services. https://doi.org/10.1109/ICALT49669.2020.00115

Fornell, C., & Larcker, D. F. (1981). Evaluating structural equation models with unobservable variables and measurement error. *Journal of Marketing Research*, *18*(1), 39–50. https://doi.org/10.2307/3151312

Hair, J. F., Black, W. C., Babin, B. J., Anderson, R. E., & Tatham, R. L. (2006). *Multivariate data analysis* (6th ed.). Pearson Prentice Hall.

Harefa, E. B. (2020). Usability measurement of Google Classroom applications as elearning for students of department of building engineering education IKIP Gunungsitoli. *Indonesian Science Education Research*, *2*(1), 11–14. https://jurnal.unimed.ac.id/2012/index.php/iser/article/view/20170/14273

Hartono, E., Kim, K.-Y., Na, K.-S., Simpson, J. T., & Berkowitz, D. (2013). Perceived site security as a second order construct and its relationship to e-commerce site usage. In Á. Rocha, A. Correia, T. Wilson, & K. Stroetmann (Eds.), *Advances in information systems and technologies* (pp. 1075–1085). Springer. https://doi.org/10.1007/978-3-642-36981-0_102

Henseler, J., Ringle, C. M., & Sarstedt, M. (2015). A new criterion for assessing discriminant validity in variance-based structural equation modeling. *Journal of the Academy of Marketing Science*, *43*, 115–135. https://doi.org/10.1007/s11747-014-0403-8

Isaac, O., Aldholay, A., Abdullah, Z., & Ramayah, T. (2019). Online learning usage within Yemeni higher education: The role of compatibility and task-technology fit as mediating variables in the IS success model. *Computers and Education*, *136*, 113–129. https://doi.org/10.1016/j.compedu.2019.02.012

Lowry, P. B., & Gaskin, J. (2014). Partial least squares (PLS) structural equation modeling (SEM) for building and testing behavioral causal theory: When to choose it and how to use it. *IEEE Transactions on Professional Communication*, *57*(2), 123–146. https://doi.org/10.1109/TPC.2014.2312452

Maqableh, M., Hmoud, H. Y., & Jaradat, M. (2021). Integrating an information systems success model with perceived privacy, perceived security, and trust: The moderating role of Facebook addiction. *Heliyon*, *7*(9), Article E07899. https://doi.org/10.1016/j.heliyon.2021.e07899

Meharia, P. (2012). Assurance on the reliability of mobile payment system and its effects on its use: An empirical examination. *Accounting and Management Information Systems*, *11*(1), 97–111. https://ideas.repec.org/a/ami/journl/v11y2012i1p97-111.html

Mshali, H., & Al-Azawei, A. (2022). Predicting online learning adoption: The role of compatibility, self-efficacy, knowledge sharing, and knowledge acquisition. *Journal of Information Science Theory and Practice*, *10*(3), 24–39. https://doi.org/10.1633/JISTaP.2022.10.3.3

Pallant, J. (2013). *SPSS survival manual: A step by step guide to data analysis using IBM SPSS* (5th ed.). McGraw Hill.

Peat, J. K., & Barton, B. (2005). *Medical statistics: A guide to data analysis and critical appraisal* (1st ed.). Blackwell Publishing.

Petter, S., & McLean, E. R. (2009). A meta-analytic assessment of the DeLone and McLean IS success model: An examination of IS success at the individual level. *Information and Management*, *46*(3), 159–166. https://doi.org/10.1016/j.im.2008.12.006

Pitt, L. F., Watson, R. T., & Kavan, C. B. (1995). Service quality: A measure of information systems effectiveness. *MIS Quarterly: Management Information Systems*, *19*(2), 173–185. https://doi.org/10.2307/249687

Ramirez-Correa, P. E., Javier Rondan-Cataluña, F., Arenas-Gaitán, J., & Alfaro-Perez, J. L. (2017). Moderating effect of learning styles on a learning management system's success. *Telematics and Informatics*, *34*, 272–286. https://doi.org/10.1016/j.tele.2016.04.006

Ringle, C. M., Wende, S., & Becker, J.-M. (2015). *SmartPLS 3*. http://www.smartpls.com

Roemer, E., Schuberth, F., & Henseler, J. (2021). HTMT2—An improved criterion for assessing discriminant validity in structural equation modeling. *Industrial Management and Data Systems*, *121*(12), 2637–2650. https://doi.org/10.1108/IMDS-02-2021-0082

Rönkkö, M., & Cho, E. (2022). An updated guideline for assessing discriminant validity. *Organizational Research Methods*, *25*(1), 6–47. https://doi.org/10.1177/1094428120968614

Salam, N. R. A., & Ali, S. (2020). Determining factors of cloud computing adoption: A study of Indonesian local government employees. *Journal of Accounting and Investment*, *21*(2), 312–333. https://doi.org/10.18196/jai.2102151

Saunders, M., Lewis, P., & Thornhill, A. (2012). *Research methods for business students* (6th ed.). Pearson.

Shim, M., & Sug Jo, H. (2020). What quality factors matter in enhancing the perceived benefits of online health information sites? Application of the updated DeLone and McLean information systems success model. *International Journal of Medical Informatics*, *137*, Article 104093. https://doi.org/10.1016/j.ijmedinf.2020.104093

Solimeno, A., Mebane, M. E., Tomai, M., & Francescato, D. (2008). The influence of students and teachers characteristics on the efficacy of face-to-face and computer supported collaborative learning. *Computers & Education*, *51*(1), 109–128. https://doi.org/10.1016/j.compedu.2007.04.003

Stallings, W. (2003). *Network security essentials: Applications and standards* (2nd ed.). Prentice Hall.

Tsiakis, T., & Sthephanides, G. (2005). The concept of security and trust in electronic payments. *Computers and Security*, *24*(1), 10–15. https://doi.org/10.1016/j.cose.2004.11.001

Venkatesh, V., & Bala, H. (2008). Technology acceptance model 3 and a research agenda on interventions. *Decision Sciences*, *39*(2), 273–315. https://doi.org/10.1111/j.1540-5915.2008.00192.x

Venkatesh, V., Morris, M. G., Davis, G. B., & Davis, F. D. (2003). User acceptance of information technology: Toward a unified view. *MIS Quarterly*, *27*(3), 425–478. https://doi.org/10.2307/30036540

Venkatesh, V., Thong, J. Y. L., & Xu, X. (2012). Consumer acceptance and use of information technology: Extending the unified theory of acceptance and use of technology. *MIS Quarterly*, *36*(1), 157–178. https://doi.org/10.2307/41410412

Zhang, Z., Cao, T., Shu, J., & Liu, H. (2020). Identifying key factors affecting college students' adoption of the e-learning system in mandatory blended learning environments. *Interactive Learning Environments*, *30*(8), 1388–1401. https://doi.org/10.1080/10494820.2020.1723113

Appendix A

The Research Questionnaire

Factor	Outer loading	Reference
Behavioral intention (BI)		
BI1: I intend to use the online learning system in the future.	0.922	Alowayr & Al-Azawei (2021)
BI2: I will always try to use an online learning system in my daily study.	0.910	
BI3: I plan to use the online learning system in the future.	0.938	
BI4: I will recommend other students to use online learning.	0.919	
Perceived satisfaction (PS):		
PS1: I am satisfied with using the online learning system as a learning-assisted tool.	0.888	Al-Azawei & Lundqvist (2015)
PS2: I am satisfied with using online learning systems' functions.	0.927	
PS3: I am satisfied with my decision to study via the Internet.	0.897	
Information quality (IQ)		
IQ1: The online learning system provides information that is exactly what I need.	0.887	Ramirez-Correa et al. (2017)
IQ2: The online learning system provides information that is relevant to my study.	0.862	
IQ3: The online learning system provides sufficient information.	0.893	
IQ4: The online learning system provides information that is easy to understand.	0.874	
IQ5: The online learning system provides up-to-date information.	0.882	
System quality (SQ)		

SQ1: The online learning system provides interactive features between learners and the system.	0.855	Ramirez-Correa et al. (2017)
SQ2: The online learning system has attractive features to appeal to the learners.	0.880	
SQ3: The online learning system provides high-speed information access.	0.855	
SQ4: The online learning system has flexible features.	0.871	
SQ5: The online learning system is a secure system.	0.781	
Service quality (SerQ)		
SerQ1: I could use the online learning services at any time, anywhere I want.	0.849	Isaac et al. (2019)
SerQ2: The online learning system offers multimedia (audio, video, and text) types of course content.	0.879	
SerQ3: The online learning system enables interactive communication.	0.874	
Actual use (AU)		
AU1: I frequently use the online learning system in my study.	0.872	Al-Azawei (2019)
AU2: I depend upon the online learning system in my study.	0.900	
AU3: I use the online learning system daily.	0.859	
AU4: I use the online learning system often.	0.643	
Perceived confidentiality (PC)		
PC1: I believe my personal information is being properly protected in the online learning system.	0.904	Meharia (2012)
PC2: I believe my personal and behavioral information is properly protected against unauthorized access by the use of user IDs and passwords in the online learning system.	0.932	
PC3: I believe my personal information is stored in a secure and encrypted database in the online learning system.	0.934	

PC4: I believe my personal information is not being exposed to an unauthorized third party in the online learning system.	0.902	
Perceived availability (PA)		
PA1: The risk of interruption of service due to purely technical issues (e.g., a malfunctioning part of a computer or communications device) is high when using the online learning system.	0.850	Meharia (2012)
PA2: The risk of interruption of service due to purely natural phenomena (e.g., wind or water) is high when using the online learning system.	0.877	
PA3: The risk of interruption of service due to human causes (accidental or deliberate) is high when using the online learning system.	0.884	
PA4: The risk of interruption of service due to changes will be communicated to management and users who will be affected when using the online learning system.	0.789	
Perceived integrity (PI)		
PI1: I believe that entering into the online learning system has not been changed inappropriately, whether by accident or deliberately maligned activity.	0.799	Meharia (2012)
PI2: I believe that the data displayed in the online learning system actually came from an authorized person or entity, rather than an imposter.	0.879	
PI3: I believe that the data that were transmitted or entered into the online learning system were not corrupted.	0.882	
PI4: I believe that errors, omissions, breaches of online learning system security, and submissions of complaints will be communicated to authorized users.	0.858	

International **R**eview of **R**esearch in **O**pen and **D**istributed **L**earning
Volume 24, Number 2

May – 2023

Stakeholder Perspectives on the Ethics of AI in Distance-Based Higher Education

Wayne Holmes[1]*, Francisco Iniesto[2], Stamatina Anastopoulou[3], and Jesus G. Boticario[4]
*[1] University College London, UK, [2] The Open University, UK, [3] University of Leicester, UK, [4] UNED, Spain, *Corresponding author*

Abstract

Increasingly, Artificial Intelligence (AI) is having an impact on distance-based higher education, where it is revealing multiple ethical issues. However, to date, there has been limited research addressing the perspectives of key stakeholders about these developments. The study presented in this paper sought to address this gap by investigating the perspectives of three key groups of stakeholders in distance-based higher education: students, teachers, and institutions. Empirical data collected in two workshops and a survey helped identify what concerns these stakeholders had about the ethics of AI in distance-based higher education. A theoretical framework for the ethics of AI in education was used to analyse that data and helped identify what was missing. In this exploratory study, there was no attempt to prioritise issues as more, or less, important. Instead, the value of the study reported in this paper derives from (a) the breadth and detail of the issues that have been identified, and (b) their categorisation in a unifying framework. Together these provide a foundation for future research and may also usefully inform future institutional implementation and practice.

Keywords: Artificial Intelligence, ethics, distance-based higher education, students, teachers, institutions, theoretical framework

Stakeholder Perspectives on the Ethics of AI in Distance-Based Higher Education

Artificial Intelligence (AI) technologies are increasingly being applied in educational settings, such as schools and universities, a development that has many practical and ethical implications that are yet to be fully understood or addressed (Holmes & Porayska-Pomsta, 2023) (NB Artificial Intelligence is capitalised to identify it as a field of enquiry rather than intelligence that is artificial; Holmes & Tuomi, 2022). Given that distance-based higher education (HE) institutions are typically online and gather huge amounts of student data, they are well-placed to incorporate AI technologies in their systems (Dogan et al., 2023). However, little is currently known about the potential or actual consequences of such a development (Bates et al., 2020). Accordingly, as such consequences begin to reveal themselves over time, and to help institutions prevent or mitigate those that are negative, this paper investigated the perspectives of the three key groups of stakeholders in distance-based higher education—students, teachers, and institutions—regarding the ethics of AI in distance-based higher education.

Introduction

To ground the following discussion, first, what exactly is meant by AI? There have been many attempts to define AI during its 60-year history; see Holmes et al. (2022) for some of those definitions. Here, in line with Holmes and Tuomi (2022), we prefer the approach provided by United Nations International Children's Emergency Fund (UNICEF, 2021):

> AI refers to machine-based systems that can, given a set of human-defined objectives, make predictions, recommendations, or decisions that influence real or virtual environments. AI systems interact with us and act on our environment, either directly or indirectly. Often, they appear to operate autonomously, and can adapt their behaviour by learning about the context. (p. 16)

AI has achieved some remarkable successes, such as the recently introduced large language models (LLMs) that can automatically generate human-like text in response to a prompt (e.g., ChatGP; OpenAI, 2022). Meanwhile, AI has also been frequently challenged: for its (a) biases that might lead to unfair and discriminatory outcomes, (b) apparently autonomous decisions that can have serious consequences, (c) impact on privacy given its use of large amounts of personal data, and (d) potential to be used for malicious purposes. AI has also been challenged for the hyperbole and the many myths surrounding it (e.g., Bender et al., 2021).

Second, what exactly is meant by AI and education (AI&ED; Holmes et al., 2022)? There are at least three dimensions of AI&ED: (a) learning with AI—using AI tools to support teaching and learning, either to deliver instruction or to accompany student learning, often referred to as AIED; (b) learning about AI—learning how AI works and how it can be created, sometimes known as the technological dimension of AI literacy; and (c) preparing for AI—learning what it means to live in a world increasingly impacted by AI, sometime known as the human dimension of AI literacy (Holmes et al., 2022; Miao & Holmes, 2021). In the study presented in this paper, we focused specifically on learning with AI, which might be further subdivided into (a) institutional-facing AI, namely AIED tools that have been designed to support the functioning of institutions, changing decision making in all areas, addressing issues such as recruitment, finances, and timetabling; (b) teacher-facing AI, namely AIED tools designed to directly

support teachers, of which there are very few examples; and (c) student-facing AI, namely AIED tools designed to directly support learning, which have been the subject of more than 40 years of research and have been commercialised by multiple million dollar-funded commercial organisations (Holmes et al., 2019; Tahiru, 2021, Teng et al., 2022).

In fact, system-facing, teacher-facing, and student-facing AIED in HE are developing rapidly, with AIED tools increasingly being provided by a rapidly growing industry of commercial organisations (Knox, 2020). Examples include (a) adaptive learning platforms (Rivera Muñoz et al., 2022); (b) automated essay grading (Ramesh & Sanampudi, 2022); (c) writing assistance (e.g., Godwin-Jones, 2022); (d) research assistance (Wagner et al., 2022); and (e) student support (Goel & Polepeddi, 2017; Wollny et al., 2021; For a more detailed discussion of the state of the art of AIED see Holmes & Tuomi, 2022). Meanwhile, the distinctive characteristics of online-distance learning, such as large numbers of students who work asynchronously with little if any face-to-face contact with faculty or peers (Ubachs et al., 2017), mean that distance-based universities are increasingly the focus of AI developers. In fact, the application of AI at scale in distance-based universities has long been explored (e.g., Boticario, 2019), while student-facing AI tools are already being used by thousands of distance students worldwide (e.g., to predict outcomes; Herodotou et al., 2020) and are likely to impact many more.

However, there remains little evidence at scale for the efficacy or impact of these applications (Holmes & Tuomi, 2022), and already multiple issues are beginning to reveal themselves. First, it has been suggested that teachers using AIED in HE rarely have sufficient experience or training to take advantage of the possibilities or to facilitate their students (Bates et al., 2020; Nichols & Holmes, 2018). Second, students in HE have diverse cultural and economic backgrounds and varied experience with the use of AIED technologies (Hashakimana & Habyarimana, 2020) as well as varied accessibility needs (especially for students who have a disability) which current AIED technologies rarely address (Iniesto et al., 2021; Miao & Holmes, 2021). Third, HE institutions perhaps need to better understand how the AI algorithms have been designed, and their impact on data privacy, ownership, and use (Bell et al., 2021; Williamson, 2020). Fourth, universities must address AIED technologies that are developing faster than the curricula in their postgraduate and undergraduate degrees (Huang, 2021).

In addition, the growing relationship between AIED and HE has occurred without serious engagement with the potential ethical consequences (Holmes et al., 2019; Holmes & Porayska-Pomsta, 2023). For example, what are the ethical implications of AIED tools designed to replace teacher functions (e.g., see XPRIZE)? In short, while the ethics of AI has been the focus of much work (Jobin et al., 2019), the ethics of the research and practice of AIED in HE has received limited attention (Bidarra et al., 2020). This is especially true of distance-based universities, where there is a lack of clear guidance, policies, and regulations to address the specific ethical issues raised using AI to enhance distance teaching and learning. For these many reasons, we conducted a qualitative exploratory study with distance-based HE students, teachers, and institutions (Zawacki-Richter et al., 2019). There is no claim that the issues uncovered generalise nor is there any attempt to prioritise which issues are more or less important. Instead, the value of the study reported in this paper derives from (a) the breadth and detail of the issues that have been identified, and (b) their categorisation in a unifying framework, which together provide a foundation for future research, and also might usefully inform future implementation and practice.

The Ethics of AI in Education

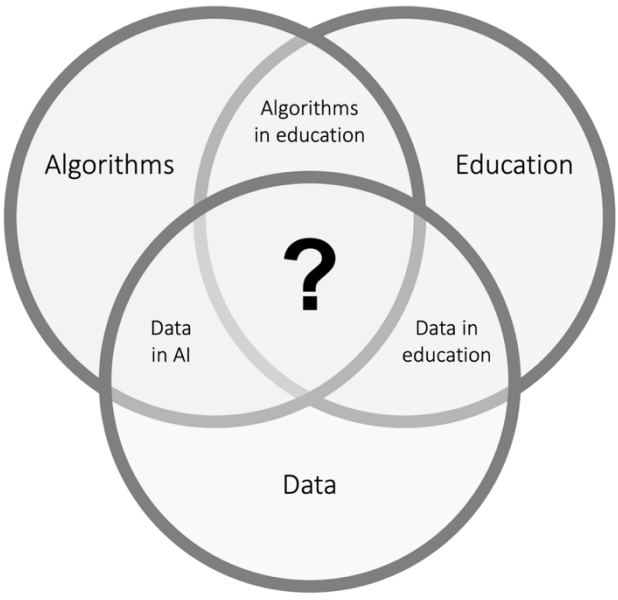
The ethics of AI in general have resulted in multiple sets of ethics guidelines, as summarised by Jobin et al. (2019) and Hagendorff (2020), as well as international recommendations (e.g., United Nations Educational, Scientific and Cultural Organization [UNESCO], 2021), almost all of which broadly focus on data and algorithms. The ethics of data involves issues such as consent, privacy, ownership, data choices, data provenance, and proxies. Meanwhile, the ethics of algorithms involves issues such as biases, unintended consequences, human control, transparency, accountability and the specificities of individual machine learning models (Crawford et al., 2019).

The ethics of AIED have also raised a variety of complex issues centred on data and how that data is analysed and exploited (i.e., the algorithms or computational approaches). However, for AIED, investigating the ethics of data and algorithms is necessary but not sufficient (Holmes et al., 2021): the ethics of learning with AI cannot be reduced to questions about data and algorithms alone. Any comprehensive ethics of learning with AI also needs to account for the ethics of education itself, which involves issues such as choice of pedagogy, what counts as useful knowledge, the teacher/student relationship, self-fulfilling expectations, student agency, surveillance, diversity, equity, inclusion, and the validity of assessments, among others (Holmes et al., 2021). In addition, some ethical issues may arise not from the decision to use AI, but from the choice of which AI approach to use (Jivet et al., 2017). This is especially true given that, all too frequently, assumptions made by some AI engineers are either naïve, unsupported, or contested by the learning sciences (Malik et al., 2021).

Holmes et al. (2021) proposed a framework that includes all three areas that need to be addressed by any comprehensive ethics of learning with AI, namely data, algorithms, and education (Figure 1).

Figure 1

Framework for the Ethics of Learning with AI



Note. Adapted from "Ethics of AI in Education: Towards a Community-Wide Framework," by W. Holmes et al., 2021, *International Journal of Artificial Intelligence in Education, Volume, 32*, pp. 504-526, https://doi.org/10.1007/s40593-021-00239-1. Copyright 2021 by Springer.

There is, however, as shown in Figure 1, a second level, in the overlaps between adjacent areas: (a) the ethics of data used in general AI, which has received a great deal of attention (Jobin et al., 2019); (b) the ethics of data used in education (more usually known as Learning Analytics or Educational Data Mining, which again has received much attention (Kitto & Knight, 2019); and (c) the ethics of algorithms in educational contexts (which, so far, has received very little attention). To give just one example for this last overlap, both emotion detection algorithms and pass-rate estimation algorithms may be set up with the best of intentions, but by default require a level of student surveillance and might all too easily lead to unexpected outcomes, such as misleading recommendations (Slade & Tait, 2019). The three main areas and the three main overlaps in Figure 1 are what Holmes et al. (2019) identified as the *known* unknowns. However, what remain to be identified or investigated are the *unknown* unknowns that exist at the overlap among all three areas, as marked with the question mark at the centre of Figure 1.

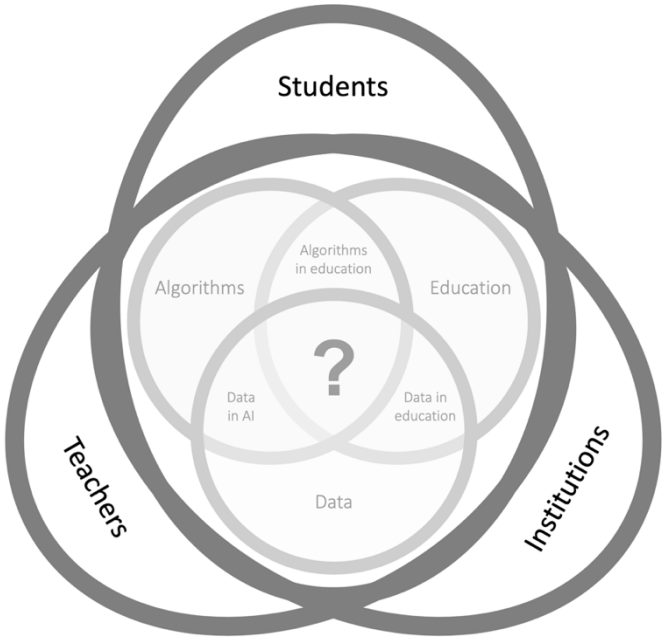
It is important to acknowledge the inevitable limitations of such a framework. It does not suggest there are clear, unambiguous or rigid differences between the various categories. Indeed, any particular issue might be placed in more than one area. Nonetheless, the framework is still useful for helping to illuminate connections and identify issues that have not yet been considered.

While discussions around the ethics of AI and education have recently begun to emerge (e.g., Holmes & Porayska-Pomsta, 2023; Holmes et al., 2021), little is yet known about the attitudes of students, teachers, and the institutions themselves regarding the ethical consequences, benefits, and risks. For example, do students and teachers welcome the introduction of AI technologies in their teaching and learning, or do they have objections (e.g., about the possible impact on human interactions)? In fact, with AI rapidly coming to distance learning, it is incumbent on the distance learning institutions to ensure that the use of AI technologies respects human values and attitudes (Holmes et al., 2022), for which knowing the opinions of key stakeholders is critical.

Accordingly, this paper set out to trigger and inform a discussion by exploring the ethics of AI in distance-based HE from the perspectives of the three key groups of stakeholders: the students, the teachers, and the institutions themselves. The overarching aim was to identify what ethical issues centred on learning with AI are of concern to these stakeholders, in order to provide a foundation for future research and to inform future implementation and practice. For this purpose, we used the framework, Figure 1, proposed by Holmes et al. (2021), amended to include the perspectives of the three stakeholder groups (Figure 2), to analyse issues of concern. The framework also helped to identify some additional potential issues of concern that were missing from the empirical data.

Figure 2

The Stakeholder Framework for the Ethics of Learning with AI That Involves the Ethics of Data, Algorithms, and Education



Note. Adapted from "Ethics of AI in Education: Towards a Community-Wide Framework," by W. Holmes et al., 2021, *International Journal of Artificial Intelligence in Education, 32*, pp. 504-526, https://doi.org/10.1007/s40593-021-00239-1. Copyright 2021 by Springer.

Methodology

This study explored the ethics of AI in distance-based higher education from the perspectives of three key groups of distance learning stakeholders: students, teachers, and the institutions themselves. It built on the student-facing, teacher-facing, system-facing trichotomy described by Holmes et al. (2019), with one key amendment. Rather than 'system', we focused on institutions, given that institutions comprise both the systems in place and the people who run them, who are, by definition, key stakeholders in the context under discussion. We used an indefinite article for each stakeholder perspective to acknowledge that there may be competing opinions within that group, and to reinforce that the identified issues were not generalised. We were interested in the views of the three groups of stakeholders as they pertain to the ethics of AI in distance learning and teaching.

- A student perspective: the day-to-day learning experiences of students, and their relationships with their peers, their teachers, and the AI technologies.

- A teacher perspective: the experiences of HE teachers (academics/lecturers/professors), in respect to their students and the AI technologies, which might include pedagogy and teacher roles.

- An institutional perspective: the institutional experiences of policy- and decision-makers, which might include top-level organisational considerations, competition, and legal as well as political concerns.

Inevitably, the three different stakeholder groups raised different research challenges and required different research methods. The students at a distance university are by definition not on a campus, nor do they often attend conferences together. Hence, this study used an online survey of students from a single distance university, the Open University (OU-UK). However, for the teacher and institutional perspectives, this study took advantage of two key international academic gatherings of distance-based higher education teachers and administrators in order to hold two workshops.

Survey

To capture some distance-based higher education university student perspectives, an online survey was designed and implemented (using Qualtrics). The survey method was adopted for its suitability for identifying rather than evaluating issues (Nayak & Narayan, 2019). It aimed to elicit a student voice on the application of AI in distance education (Holmes & Anastopoulou, 2019). In particular, the survey explored students' thoughts, opinions, understanding of, and emotional disposition towards the application of AI to support students, staff, teaching, and learning.

The survey was conducted at a single online distance university, the OU-UK, with 2,500 randomly selected current distance students invited to participate. The survey was open for 21 days, during which time a self-selected sample of 221 (~9%) responded, with 155 answering all of the questions and the others answering most but not all the questions. The low response rate was within the range expected by the university when surveying its students. Undertaking the survey was voluntary, no incentives were offered, and no questions were compulsory. The survey comprised 13 closed questions and 10 open-ended questions, which together covered a wide range of issues. For the study reported in this paper, we have included here only the three open-ended questions that addressed the ethics of AI in online distance universities:

- What (if any) are your hopes for the application of Artificial Intelligence in online distance universities?

- What (if any) are your fears for the application of Artificial Intelligence in online distance universities?

- What (if any) ethical concerns do you think there are around the application of Artificial Intelligence in online distance universities?

Workshops

Two workshops were held to capture some perspectives of online distance university teachers and institutions. Workshops were adopted as a research method for their suitability for identifying and discussing rather than rigorously evaluating issues (Ørngreen & Levinsen, 2017). The workshops were held at conferences in 2019. One was organised by the European Association of Distance Teaching Universities (EADTU) in October, 2019 in Madrid, the "Online, Open and Flexible Higher Education Conference" which focussed on trends in global and European higher education in blended and distance learning. The other was the International Council for Open and Distance Education (ICDE) "World Conference on Online Learning" in Dublin, November 2019, which aimed to anchor the growth of new

models of open, online and digital learning in the wider context of UNESCO's sustainable development goals.

At each conference the workshops were called "The Ethics of Artificial Intelligence to Enhance Distance Teaching: Who Cares?" The workshops were designed and organised by the authors as an opportunity for researchers exploring ethical issues around the use of AIED in distance-based higher education to share their insights, identify key ethical issues, map out ways to address the multiple challenges, and inform best practice. They aimed to help establish a basis for meaningful ethical reflection necessary for innovation and built on the experience of three earlier similar workshops organised by the authors at the AIED conferences in 2018 and 2019 (Holmes et al., 2018) and the European Conference on Technology Enhanced Learning conference in 2019.

Participants in each workshop contributed to the discussions and were self-selected from the attendees at the EADTU and ICDE conferences named above. They comprised around 30 international distance education teachers and institutional stakeholders, including lecturers (professors), researchers, administrators, and institutional policymakers. The workshops used a participatory approach, with round-table small-group discussions triggered by provocative statements to address proposed AI in distance-based higher education challenges as well as whole-workshop discussions. Both workshops began by considering what the ethics of AI in distance education might look like in 2025, and what needs to be done to ensure its effects are worthwhile. Questions included: *What data are collected, and what data should not be collected? How can informed consent be assured? What data, algorithmic, or other biases might need to be addressed? How do we protect student and teacher agency, and protect against unintended consequences? How do we assure the accuracy and validity of AI-assisted assessments?* The workshop participants were encouraged to add their reactions, thoughts, ideas, and concerns to a shared Padlet virtual bulletin board.

Analysis

For both the survey and workshop data, we undertook a thematic analysis (Joffe, 2012). First, both sets of data were read and coded by at least two researchers, using the novel framework shown in Figure 2. These codes were then reviewed by two different researchers, and then the data under each code was summarised. Every effort was made to represent and summarise the data accurately and fairly; even so, the authors were aware that they may still have introduced biases. Nonetheless, given the exploratory nature of the study reported in this paper, unlike in a systematic review, any such biases are unlikely to have notably skewed the results.

Results

The survey responses and the contributions made in both workshops demonstrated that the topic of ethics of AI in distance-based higher education was thought to be, at least by these particular participants, of importance and thus worthy of further inquiry. To illustrate, we begin this section of the paper with some example direct quotations from the survey and workshops arranged according to the three stakeholder perspectives (student, teacher, institutional), in a tabular version (Table 1) of Figure 2.

Table 1

Illustrative Direct Quotations From the Three Stakeholder Perspectives, Organised According to the Stakeholder Framework for the Ethics of Learning With AI

Framework category	Students	Teachers	Institutions
Data	"Can we use student data to develop AI models without student agreement?" (W2)	"Teachers do not understand the consequences of how to use data of their students, not even from the educational viewpoint." (W2)	"What frameworks should we trust the "ethics" of AI enterprises?" (W2)
Data in AI	"The system in order to operate more effectively will need to *know* more about the individual, this leaves data much more vulnerable as the temptation to malicious individuals who have nothing better to do." (S)		
Algorithms	"AI could override the socio-economic background of students by predicting their needs." (W1)	"We need AI to train teachers to work (together) with AI tools." (W1)	"Educational institutions are already keeping a lot of data that potentially can be used to help the students but can also be misused." (W2)
Data in education	"Any attempts to cover up the use of AI tools (e.g., by trying to make them too 'human' in their interactions). It should always be possible to distinguish an AI tool being used." (S).		
Education	"I feel by using AI this will lower the educational standards." (S)	"Re-allocating teacher resources where AI is doing all the "boring" stuff and teachers can concentrate on things that matter more, like helping disabled students." (W2)	"The use of AI in education will change the whole ecosystem of education to build trust of all stakeholders." (W1)
Algorithms in education	"There is a huge asymmetry in an understanding of both the reality and potential of AI between commercial interests and policy-makers." (W2)		

Note. W1 = EADTU workshop; W2 = ICDE workshop; S = survey.

In the following sections, we summarise issues raised in the survey and workshops from student, teacher, and institutional perspectives. In Table 2, example issues are summarised according to the stakeholder framework for the ethics of learning with AI.

A Student Perspective

Issues raised by participants that were of particular relevance to students included informed consent, data ownership, privacy, personalisation, biases, and social impact. To begin, various participants argued that AI has the potential to improve learning, by providing more personalised support, perhaps delivered by personal lifelong learning companions, thus leading to better results. However, the actual

meanings of the words personalised, improve, and better were not explored. For example, AI systems might help overcome the socio-economic disadvantages of at-risk students by predicting and addressing their specific needs—although students who are economically disadvantaged might not even be able to access the best technologies and so might lose out. In fact, personalised learning systems might also lead to students being homogenised, the polar opposite of individualised: the current crop of so-called personalised systems aim to ensure that all the students learn the same things.

Another key focus was informed consent. Do students have a genuine opportunity to choose whether to opt in or opt out of the AI system, a possibility that should be but is not always available (Khalil et al., 2018)? In particular, what about the data that the system collects? Currently, there is no clear understanding of (a) who owns the data (the student, the institution or the private company who runs the system?); (b) what the impact of that data is on privacy; or (c) how biases from partial data or algorithms might be identified and mitigated. Another risk noted by participants was that, by focusing on human-to-machine interactions over human-to-human interactions, and especially when the systems are driven by industry needs rather than student needs, learning might become dehumanised, lacking the benefits of social interaction, student-to-student collaboration, communities of learning, and emotional understanding.

A Teacher Perspective

Issues raised by participants that were of particular relevance to teachers included data, training and support, supporting versus replacing teachers, saving teacher time, and human interactions. The usefulness of data to support teacher decision making was mentioned by many participants, together with the acknowledgement that teachers are rarely experienced in using student data effectively. This leads to the second issue, that of the need for teacher training in AI—what it is and how it might be used in education, as well as the many implications related to these concerns. In recent years, there has been a great deal of emphasis on teachers' digital competencies and digital literacy, which now needs to be extended to include AI, and should be embedded in teacher training. Similarly, participants suggested that teachers should be supported to navigate the many free resources online, to identify those videos and other materials that are of high quality, as that will help them better understand the potential and impact of AI. Therefore, it seems that teachers, as well as students, are demanding more clear messages on what, where, and how to use AIED.

Participants mentioned another issue of importance from a teacher perspective, that of whether the AI applied in educational contexts has been designed to support teachers or, as is the case with many current applications, to replace teacher functions and thus by default to potentially replace teachers. Despite the rhetoric, for example that AI will save teacher time and allow them to focus on other aspects of supporting their students, an argument that has been made for educational technology since the 1930s, which does not appear to have been realised (Watters, 2021), and for which there is currently little evidence, teachers might understandably be concerned. As the AI becomes more sophisticated, what will be the impact on their role (might they change from teacher to mentor?) or on their jobs, as they will always be more expensive than machines? Similarly, with students spending more time engaging one-on-one with the AI programmes, what will be the impact on human interactions (teacher-student and student-student) and on broader understandings of learning?

Table 2

Example Issues From the Three Stakeholder Perspectives, Organised According to the Stakeholder Framework for the Ethics of Learning With AI

Framework category	Students	Teachers	Institution
Data	W1: The value of data W2: Ownership of data H: – F: – E: Informed consent	W1: Training teachers W2: Teachers supported by AI H: – F: – E: –	W1: Data misuse W2: Anti-fraud assessment H: – F: – E: Data breach
Data in AI	W1: Less human more ethics in AI W2: Data misuse H: – F: Privacy E: Privacy		
Algorithms	W1: Consent W2: Personalising learning H: Learning paths F: Increased disadvantaged E: –	W1: – W2: Training teachers H: Better support for the teacher F: Lack of human interaction E: –	W1: – W2: Trustable technology H: support institutional services F: not guaranteed value for money E: –
Data in education	W1: – W2: – H: Better teacher support F: – E: Being aware that it is AI		
Education	W1: – W2: Students are unique H: AI to enhance learning F: Lack of human interaction E: Poorer learning experience	W1: Reallocating teachers' resources W2: Changing role of teachers H: Keep educators F: AI to replace teachers E: AI to replace teachers	W1: Stakeholders trust W2: Quality assurance H: AI to provide better courses F: AI not fit for purpose E: –
Algorithms in education	W1: Reality and potential of AI W2: Biases and commercial aspects H: – F: – E: Biases in decision making		

Note. W1 = EADTU workshop; W2 = ICDE workshop; H = hopes (survey question 13); F = fears (survey question 14); E = ethical concerns (survey question 15).

An Institutional Perspective

Issues raised by participants that were of particular relevance to institutions included data, trust, the advantages of AI, and the challenges of implementation. To begin, participants noted that many distance-based institutions, particularly those that are mainly online, already collect a wide range of data that might potentially be used to improve institution services and support students. However, participants also noted that, without care, this data could all too easily be misused or lead to unintended consequences.

Accordingly, participants suggested, as AI is increasingly being applied to support teaching and assessment, institutions will have to ensure that data models are accurate and well-protected; they must place increasing emphasis on preventing data breaches and data fraud. Participants also noted an asymmetry between HE institutions and the AI companies about the benefits that AI might genuinely bring, and about the implications—a disparity that needs to be negotiated (Renz & Hilbig, 2020).

Participants also broadly agreed that the application of AI in HE is generally beneficial for institutions, thanks to its ability to identify patterns of behaviour to profile students and make effective recommendations. However, they also noted that there is an ever-present danger that mistakes from the past, such as gender biases, can be embedded unintentionally in AI systems, reducing both their acceptability and their effectiveness. Finally, participants also noted the institutional challenges of implementing AI systems widely in HE settings. While specific technologies can easily be piloted in limited contexts, it becomes much more difficult to include AI systems in institutional IT systems while avoiding bringing the whole system down. Large-scale implementation will have pedagogical, organisational, legal, technical, and ethical consequences, all of which need to be identified and robustly addressed.

Discussion

The survey and workshops identified a wide range of issues pertaining to the ethics of AI used in online distance universities, many of which might be more widely applicable. However, when this data was aligned with the theoretical framework, various gaps appeared suggesting other issues that ought to be considered. To use a grandiose metaphor, consider how Mendeleev proposed the existence of gallium due to a gap in his periodic table (Uppenbrink, 2000). For example, even though the survey and workshop participants had not mentioned them, many potential issues centred on human rights (Holmes et al., 2022). Accordingly, in Table 3, we have summarised the empirical issues (i.e., those arising from the survey and the workshops), augmented by some theoretical issues (identified by italic font and square brackets) that participants did not mention but that emerge from a reflection on the extended framework. In other words, the theoretical framework helped identify some gaps in the empirical data. For example, it was notable that the ethics of education was mostly missing, with all but one response focusing on data or algorithms.

Table 3

Interpretation of the Empirical Issues and Theoretical Issues From the Three Stakeholder Perspectives

Framework category	Students	Teachers	Institutions
Data	• right to withhold personal data and consent • right to data security and privacy • *[right to see/access data collected about them]* • right to own data that they created • awareness that data has institutional and commercial value	• right to be trained about data • right to know how data about their teaching is used by the institution • *[right to withhold personal data and consent]* • *[right to own data that they created]* • *[right to data security and privacy]* • *[awareness that data has institutional and commercial value]*	• responsibility to respect GDPR and data ownership • *[responsibility to institute clear informed consent practices and to respect the outcomes]* • awareness of the impact of data on student/ teacher privacy *[and individual agency]* • responsibility to keep datasets accurate and up to date • responsibility to prevent data breaches and data fraud • *[awareness that commercial AI systems might mean commercial exploitation of student and teacher data]*
Data in AI	• responsibility to ensure accurate, unbiased and well-protected data models • responsibility to avoid the misuse of data models		
Algorithms	• awareness that personalisation can mean homogenisation • right to algorithmic privacy (e.g., right for systems not to infer personal emotional states) • right to opt in/opt out of algorithms • right to be trained in AI, to enable rational choices • right to be supported to navigate AI-powered online resources • right to better understand the potential and impact of AI *[right to learn how to interpret the outcomes of algorithmic analyses]* • *[responsibility to reflect on how AI systems inform decision making]* • responsibility to understand how data is analysed. • responsibility to allow individuals to decide how their data is analysed. • *[responsibility to interpret data in multicultural contexts]* • *[responsibility to understand how inaccurate or outdated student models affect later decisions]* • *[responsibility to consider the impact of predictions on student self-efficacy, resilience and mental health]*		

Data in education	● *[awareness that data in education is always limited: it only represents online activities (e.g., interaction with a learning management system) and does not include offline activities (e.g., reading a book or engaging in collaborative problem-solving]*		
Education	● *[right to high quality and appropriate pedagogy]* ● *[right to collaborative engagement with teachers and students]* ● *[right to individual agency]*	● *[right to high quality engagement and relationships with students]*	● awareness of importance of trust in relationships between institutions, students, and commercial suppliers ● *[awareness of importance of human agency in teaching and learning]* ● *[responsibility to ensure education is inclusive (i.e., does not discriminate based on gender, disability or socio-economic status)]* ● *[responsibility to ensure students are free from surveillance]*
Algorithms in education	● awareness of unintentional biases ● awareness of disparity between commercial and academia interests ● awareness that personalised support might not contribute to better results ● *[awareness that AI often replaces teacher functions and so might replace teachers]* ● *[awareness that teachers need professional development]* ● *[requirement to take responsibility when AI goes wrong]* ● *[awareness that AI profiles students (engages in surveillance)]*		

Note. Empirical issues are shown in non-italics font; while theoretical issues are shown in italic font and square brackets.

Next, we discuss both the empirical and the theoretical issues for the ethics of learning with AI in terms of the three stakeholder perspectives.

A Student Perspective on the Empirical and Theoretical Issues

As mentioned by the participants, or emerging from the reflection on the framework, from a student's perspective there are multiple ethical issues centred on data: the right to withhold personal data, the right to see/access data collected about them, the right to data security and privacy, and the right to own the data that they create when they engaged with an AI system.

There was also the need for students to be made aware, as part of the informed consent process, that data has institutional and commercial value. In fact, it has been argued that the meaning of consent in the digital age is negotiable (Tarran, 2018). In any case, there is a fundamental difference between legal consent, where users simply tick a box after having been presented with screeds of fine print

information, and ethical consent where users fully understand and are comfortable with how their data is being used.

Similar issues arise regarding AI algorithms: the right to opt in or opt out of particular algorithms, and the right to algorithmic privacy, which includes the right not to be surveilled and not to have one's personal emotional states inferred and used. While the aim of this algorithmic surveillance and profiling might be laudable (e.g., to move students from negative to positive emotional states in order to enhance their learning), it might be argued that it represents an unacceptable infringement of personal privacy. In addition, students should be aware that despite the putative benefits of so-called personalisation through algorithms, the unintended consequences could be homogenisation rather than enabling students to develop their individual potential or to self-actualise.

Finally, while participants mentioned few, there are also multiple education-specific rights that any application of AI in distance-based HE and elsewhere must address, including but not limited to the right to high quality and appropriate pedagogy, the right to collaborative engagement with teachers and students, and the right to individual agency. To give one example, what are the ethical consequences of data collected automatically by a learning management system being analysed in order to predict student success or failure? Given that students have the human right to view that data (Holmes et al., 2022), presumably they also have the right to view the prediction. However, if the prediction is that the student will fail, what is the potential impact on the student – will they redouble their efforts or give up? While learners have sometimes been asked for their general views on the use of predictive learning analytics (e.g., Rets et al., 2023), the ethical question of the impact of such a prediction on student self-efficacy, resilience and mental well-being is yet to be properly considered.

A Teacher Perspective on the Empirical and Theoretical Issues

Regarding data, this study suggested that teachers should have the same rights as students (e.g., consent, privacy, and ownership). They also have the right to know how data about their teaching is being used, and that the data has institutional and commercial value. It also needs to be recognised that teachers are not necessarily familiar with how data is collected and analysed, how best to deal with it, and how it impacts on their teaching or their students (whether positively or negatively). Accordingly, professional development programmes for teachers need to be developed and made available, covering, for example, how to interpret data, what data might be missing, and the ethical consequences for teachers and their students. In particular, this should address the fact that data in education is always limited: it only represents online activities (e.g., interaction with a learning management system) and does not include offline activities (e.g., reading a book or engaging in collaborative problem-solving). Professional development also needs to include algorithmic literacy, how the algorithms manipulate data and make recommendations, and how teachers can make a humanistic use of AI in their classrooms (Miao & Holmes, 2021). Issues such as unintentional biases, the disparity between commercial and academia interests, the awareness that AI often replaces teacher functions and so could possibly replace teachers, and that AI profiling might be considered surveillance, all need to be addressed. Teachers should also be encouraged to engage with other challenging issues, such as the question of whether the application of AI in education genuinely saves teacher time, something that educational technologists have promised (but not delivered) for almost 100 years. As well, does so-called personalised support genuinely contribute to better student outcomes (in terms of knowledge, skills, and values—not just examination results)?

An Institutional Perspective on the Empirical and Theoretical Issues

For institutions, the ethical issues related to data and algorithms tend to be responsibilities rather than rights, including the responsibility to (a) respect data regulations (such as GDPR); (b) respect student privacy and ownership of their data; (c) ensure that consent is fully informed and freely given (not just ticked by the student when they first enrolled many months previously); and (d) safeguard data security. An ethical institutional approach also involves ensuring that data is (a) accurate, up-to-date, unbiased, inclusive (e.g., it does not discriminate based on gender, disability, socio-economic status); (b) well-protected (to prevent data breaches, data misuse, and data fraud); and (c) easily challenged by students and teachers, while recognising that the data always only provides a partial picture of student achievements. Such an approach also means ensuring that algorithmic analyses are fair, transparent, valid, and reliable. At the same time, it is necessary to avoid (a) biased assumptions (perhaps because of the multi-cultural contexts within which it is collected); (b) outdated medical models (such as disability classifications still used in many educational contexts); and (c) statistical apophenia (finding causal patterns where no meaningful patterns are present). Instead, the key is to focus on humanistic approaches to teaching and learning such as promoting student agency and avoiding student surveillance.

Institutions also need to take care when partnering with commercial enterprises, whose values usually differ from the university's, especially given that student data is usually exploited outside the institution by the commercial developer. Institutions should ensure that any commercial partners meet the highest ethical standards, and that their practices are demonstrably trustworthy. This also raises the issue of trust, between institutions and students, as well as between institutions and the commercial organisations that are providing the AI systems. In order to develop trust, the systems and the companies need to be trustworthy. The onus should be put on the system developers themselves to ensure that they deserve trust; rather than on the students to trust something that might or might not be trustworthy.

Finally, it is critical to engage with the promises that AI is supposed to deliver (such as personalised learning) while encouraging the use of innovative approaches to teaching, learning and assessment—rather than simply automating poor pedagogic practices. For example, institutions might encourage the development of AI that enables more nuanced, accurate, and valid assessment of student achievements, rather than AI that simply automates or proctors exams.

Conclusion

This paper investigated the perspectives of key stakeholders on the ethics of artificial intelligence applied in distance-based higher education. Two workshops and a survey helped identify multiple concerns, to which were added some missing concerns that emerged from a reflection on an ethics of learning with AI framework (Holmes et al., 2021). The study identified multiple ethical issues (or issues with ethical implications) in terms of data, algorithms, and education, as well as their overlaps. Key takeaways (no doubt, readers can think of other potential missing issues, to input to the discussion that this paper aims to stimulate), many of which are likely applicable beyond the specific context of distance-based HE to HE in general, include the following ethical requirements.

- Use data extremely carefully (ensuring, for example, data security and privacy, and human ownership and control).
- Be aware that
    - data in education is always limited (it only represents online activities and does not include offline activities),
    - data has institutional and commercial value, and
    - both legal and ethical consent needs to be properly addressed.
- Take a critical attitude towards the questionable and unsubstantiated claims that are often made (such as AI saving teachers' time) and towards how AI algorithms are used, especially when it involves
    - student surveillance or other unacceptable infringements of personal privacy,
    - personalised learning that actually homogenises student outcomes, or
    - automating poor pedagogic practices (such as exams) rather than developing innovative approaches (to assessment).
- Develop and make available high quality professional development for teachers (covering all of these issues and more).
- Develop international regulations to both facilitate high standards for, and control the development and deployment of, AI in distance-based HE contexts.
- Ensure that the use of AI in distance-based education facilitates a humanistic approach that embodies positive human values.

To reiterate, we do not claim that the range of ethical issues discussed in this paper are definitive. The ethical concerns that ought to be considered are only likely to grow further as new AI developments are deployed in educational contexts, as evidenced by the novel ethical issues raised relatively recently by LLMs, such as ChatGPT, potentially being used by students to write essays (Susnjak, 2022). Nor is there any attempt to prioritise which issues are more or less important. These and other limitations (e.g., that only students from one distance university were surveyed) are being addressed in ongoing research. Instead, the value of this paper derives from the breadth and detail of the ethical issues that have been identified, partly empirical (from the survey and workshops' data) and partly theoretical (inferred by means of a framework). Together, this not only provides a foundation for future debate and research, it also might usefully inform future institutional implementation and practice, and appropriate regulations. In particular, the paper highlights the value of engaging with all relevant stakeholders—students, teachers, and institutions—to help ensure that the application of AI in distance-based HE is genuinely for the benefit of all.

References

Bates, T., Cobo, C., Mariño, O., & Wheeler, S. (2020). Can artificial intelligence transform higher education? *International Journal of Educational Technology in Higher Education*, *17*(1), 42. https://doi.org/10.1186/s41239-020-00218-x

Bell, G., Gould, M., Martin, B., McLennan, A., & O'Brien, E. (2021). Do more data equal more truth? Toward a cybernetic approach to data. *Australian Journal of Social Issues*, *56*(2), 213–222. https://doi.org/10.1002/ajs4.168

Bender, E. M., Gebru, T., McMillan-Major, A., & Shmitchell, S. (2021). On the dangers of stochastic parrots: Can language models be too big? *Proceedings of the 2021 ACM Conference on Fairness, Accountability, and Transparency* (pp. 610–623). https://doi.org/10.1145/3442188.3445922

Bidarra, J., Simonsen, H., & Holmes, W. (2020, June). *Artificial intelligence in teaching (AIT): A road map for future developments* [Presentation]. EMPOWER Webinar Week (EADTU). https://doi.org/10.13140/RG.2.2.25824.51207

Boticario, J. G. (2019, 16–18 October). *A roadmap towards personalized learning based on digital technologies and AI at Higher Education*. OOFHEC2019: The Online, Open and Flexible Higher Education Conference. Available at https://canal.uned.es/video/5da96278a3eeb0d93f8b4568

Crawford, K., Dobbe, R., Dryer, T., Fried, G., Green, B., Kaziunas, E., Kak, A., Mathur, V., McElroy, E., Sánchez, A. N., Raji, D., Rankin, J. L., Richardson, R., Schultz, J., West, S. M., & Whittaker, M. (2019). *AI NOW 2019 report*. AI Now Institute. https://ainowinstitute.org/AI_Now_2019_Report.pdf

Dogan, M. E., Goru Dogan, T., & Bozkurt, A. (2023). The use of artificial intelligence (ai) in online learning and distance education processes: A systematic review of empirical studies. *Applied Sciences*, *13*(5), Article 5. https://doi.org/10.3390/app13053056

Godwin-Jones, R. (2022). Partnering with AI: Intelligent writing assistance and instructed language learning. *Language Learning and Technology*, *26*(2), 5–24. https://doi.org/10125/73474

Goel, A. K., & Polepeddi, L. (2017). *Jill Watson: A virtual teaching assistant for online education* (College of Computing Technical Report No. 503). Georgia Tech. https://smartech.gatech.edu/bitstream/handle/1853/59104/goelpolepeddi-harvardvolume-v7.1.pdf

Hagendorff, T. (2020). The Ethics of AI Ethics: An Evaluation of Guidelines. *Minds and Machines*, *30*(1), 99–120. https://doi.org/10.1007/s11023-020-09517-8

Hashakimana, T., & Habyarimana, J. de D. (2020). The prospects, challenges and ethical aspects of artificial intelligence in education. *Journal of Education*, *3*(7), 14–27. https://stratfordjournals.org/journals/index.php/journal-of-education/article/view/655

Herodotou, C., Rienties, B., Hlosta, M., Boroowa, A., Mangafa, C., & Zdrahal, Z. (2020). The scalable implementation of predictive learning analytics at a distance learning university: Insights from a longitudinal case study. *The Internet and Higher Education*, *45*, 100725. https://doi.org/10.1016/j.iheduc.2020.100725

Holmes, W., & Anastopoulou, S. (2019). What do students at distance universities think about AI? *Proceedings of the Sixth ACM Conference on Learning @ Scale. Association for Computing Machinery* (Article No.: 45; pp. 1–4). https://doi.org/10.1145/3330430.3333659

Holmes, W., Bektik, D., Whitelock, D., & Woolf, B. P. (2018). *Ethics in AIED: Who Cares?* (C. Penstein Rosé, R. Martínez-Maldonado, H. U. Hoppe, R. Luckin, M. Mavrikis, K. Porayska-Pomsta, B. McLaren, & B. du Boulay, Eds.; Vol. 10948, pp. 551–553). Springer International Publishing. https://doi.org/10.1007/978-3-319-93846-2

Holmes, W., Bialik, M., & Fadel, C. (2019). *Artificial intelligence in education. Promises and implications for teaching and learning*. Center for Curriculum Redesign.

Holmes, W., Persson, J., Chounta, I.-A., Wasson, B., & Dimitrova, V. (2022). *Artificial intelligence and education. A critical view through the lens of human rights, democracy, and the rule of law*. Council of Europe. Available at: https://rm.coe.int/artificial-intelligence-and-education-a-critical-view-through-the-lens/1680a886bd

Holmes, W., & Porayska-Pomsta, K. (Eds.). (2023). *The ethics of AI in education. Practices, challenges, and debates*. Routledge.

Holmes, W., Porayska-Pomsta, K., Holstein, K., Sutherland, E., Baker, T., Buckingham Shum, S., Santos, O. C., Rodrigo, M. M. T., Cukorova, M., Bittencourt, I. I., & Koedinger, K. (2021). Ethics of AI in education: Towards a community-wide framework. *International Journal of Artificial Intelligence in Education, 32, 504–526*. https://doi.org/10.1007/s40593-021-00239-1

Holmes, W., & Tuomi, I. (2022). State of the art and practice in AI in education. *European Journal of Education: Research, Development and Policies*, *57*(4), 542–570. https://doi.org/10.1111/ejed.12533

Huang, X. (2021). Aims for cultivating students' key competencies based on artificial intelligence education in China. *Education and Information Technologies*, *26*, 5127–5147. https://doi.org/10.1007/s10639-021-10530-2

Iniesto, F., Coughlan, T., & Lister, K. (2021). Implementing an accessible conversational user interface: Applying feedback from university students and disability support advisors. *Proceedings of the 18th International Web for All Conference. Association for Computing Machinery (Article No.: 45;* pp. 1–5) https://doi.org/10.1145/3430263.3452431

Jivet, I., Scheffel, M., Drachsler, H., & Specht, M. (2017). Awareness is not enough: Pitfalls of learning analytics dashboards in the educational practice. In É. Lavoué, H. Drachsler, K. Verbert, J. Broisin & M. Pérez-Sanagustín (Eds.), *Data Driven Approaches in Digital Education* (pp. 82–96). Springer International Publishing. https://doi.org/10.1007/978-3-319-66610-5_7

Jobin, A., Ienca, M., & Vayena, E. (2019). Artificial intelligence: The global landscape of ethics guidelines. *Nature Machine Intelligence*, *1*(9), 389–399. https://doi.org/10.1038/s42256-019-0088-2

Joffe, H. (2012). Thematic analysis. *Qualitative research methods in mental health and psychotherapy*, *1*, 210–223. https://doi.org/10.1002/9781119973249.ch15

Khalil, M., Prinsloo, P., & Slade, S. (2018). User consent in MOOCs: Micro, meso, and macro perspectives. *The International Review of Research in Open and Distributed Learning*, *19*(5). https://doi.org/10.19173/irrodl.v19i5.3908

Kitto, K., & Knight, S. (2019). Practical ethics for building learning analytics. *British Journal of Educational Technology*, *50*(6), 2855–2870. https://doi.org/10.1111/bjet.12868

Knox, J. (2020). Artificial intelligence and education in China. *Learning, Media and Technology*, *45*(3), 298–311. https://doi.org/10.1080/17439884.2020.1754236

Malik, A., Demszky, D., Koh, P. W., Doumbouya, M., Hudson, D. A., Nie, A., Nilforoshan, H., Tamkin, A., Brunskill, E., Goodman, N., & Piech, C. (2021). Education. In R. Bommasani, D. A. Hudson, & E. Adeli (Eds.), *On the opportunities and risks of foundation models* (pp. 67–72). https://arxiv.org/abs/2108.07258

Miao, F., & Holmes, W. (2021). *AI and education: Guidance for policy-makers*. UNESCO. https://unesdoc.unesco.org/ark:/48223/pf0000376709

Nayak, M., & Narayan, K. A. (2019). Strengths and weaknesses of online surveys. *Technology*, *6*(7), https://doi.org/10.9790/0837-2405053138

Nichols, M., & Holmes, W. (2018). Don't do evil: Implementing artificial intelligence in universities. In J. M. Duart & A. Szűcs (Eds.), *Towards personalized guidance and support for learning* (pp. 109–117). European Distance and E-Learning Network. https://www.eden-online.org/proc-2485/index.php/PROC/article/view/1669

OpenAI. (2022, November 30). ChatGPT: Optimizing language models for dialogue. *OpenAI*. https://openai.com/blog/chatgpt/

Ørngreen, R., & Levinsen, K. (2017). Workshops as a research methodology. *Electronic Journal of E-Learning*, *15*(1), 70–81. https://vbn.aau.dk/en/publications/workshops-as-a-research-methodology

Ramesh, D., & Sanampudi, S. K. (2022). An automated essay scoring systems: A systematic literature review. *Artificial Intelligence Review*, *55*(3), 2495–2527. https://doi.org/10.1007/s10462-021-10068-2

Renz, A., & Hilbig, R. (2020). Prerequisites for artificial intelligence in further education: Identification of drivers, barriers, and business models of educational technology companies. *International Journal of Educational Technology in Higher Education*, *17*(1), 14. https://doi.org/10.1186/s41239-020-00193-3

Rets, I., Gillespie, A., & Herodotou, C. (2023). Six Practical Recommendations Enabling Ethical Use of Predictive Learning Analytics in Distance Education. *Journal of Learning Analytics*, *10*(1), (Early Access). https://doi.org/10.18608/jla.2023.7743

Rivera Muñoz, J., Berríos, H., & Arias-Gonzales, J. (2022). Systematic review of adaptive learning technology for learning in higher education. *Eurasian Journal of Educational Research*, *98*, 221–233. https://doi.org/10.14689/ejer.2022.98.014

Slade, S., & Tait, A. (2019). *Global guidelines: Ethics in learning analytics*. International Council for Open and Distance Education. https://bit.ly/3kKXSvA

Susnjak, T. (2022). *ChatGPT: The end of online exam integrity?* ArXiv Preprint https://doi.org/10.48550/arXiv.2212.09292

Tahiru, F. (2021). AI in education: A systematic literature review. *Journal of Cases on Information Technology*, *23*(1), 1–20. https://doi.org/10.4018/JCIT.2021010101

Tarran, B. (2018). What can we learn from the Facebook-Cambridge Analytica scandal? *Significance*, *15*(3), 4–5. https://doi.org/10.1111/j.1740-9713.2018.01139.x

Teng, Y., Zhang, J., & Sun, T. (2022). Data-driven decision-making model based on artificial intelligence in higher education system of colleges and universities. *Expert Systems*, e12820. https://doi.org/10.1111/EXSY.12820

Ubachs, G., Konings, L., & Brown, M. (2017). *The envisioning report for empowering universities*. EADTU. https://empower-new.eadtu.eu/images/report/The_Envisioning_Report_for_Empowering_Universities_1st_edition_2017.pdf

United Nations Educational, Scientific and Cultural Organization. (2021). *Recommendation on the ethics of artificial intelligence*. UNESCO. https://unesdoc.unesco.org/ark:/48223/pf0000381137

United Nations International Children's Emergency Fund. (2021). *Policy guidance on AI for children*. UNICEF. https://www.unicef.org/globalinsight/media/2356/file/UNICEF-Global-Insight-policy-guidance-AI-children-2.0-2021.pdf

Uppenbrink, J. (2000). Mendeleyev's dream. *Science*, *289*(5485), 1696–1696. https://www.jstor.org/stable/i355109

Wagner, G., Lukyanenko, R., & Paré, G. (2022). Artificial intelligence and the conduct of literature reviews. *Journal of Information Technology*, *37*(2), 209–226. https://doi.org/10.1177/02683962211048201

Watters, A. (2021). *Teaching machines: The history of personalized learning*. MIT Press.

Williamson, B. (2020). Datafication of education. In H. Beetham & R. Sharpe (Eds.), *Rethinking pedagogy for a digital age* (pp. 212–226). Routledge. https://doi.org/10.4324/9781351252805-14

Wollny, S., Schneider, J., Di Mitri, D., Weidlich, J., Rittberger, M., & Drachsler, H. (2021). Are we there yet? A systematic literature review on chatbots in education. *Frontiers in Artificial Intelligence*, *4*, 654924. https://doi.org/10.3389/frai.2021.654924

Zawacki-Richter, O., Marín, V. I., Bond, M., & Gouverneur, F. (2019). Systematic review of research on artificial intelligence applications in higher education: Where are the educators? *International Journal of Educational Technology in Higher Education*, *16*(1). https://doi.org/10.1186/s41239-019-0171-0

International **R**eview of **R**esearch in **O**pen and **D**istributed **L**earning
Volume 24, Number 2

May – 2023

Instructor Leadership and the Community of Inquiry Framework: Applying Leadership Theory to Higher Education Online Learning

Sally Meech* **and Adrie A. Koehler**
Purdue University, West Lafayette, Indiana
**corresponding author*

Abstract

Higher education institutions continue to invest in online learning, yet research indicates instructors often lack experience, preparation, and guidance for teaching online. While instructor leadership is essential for meaningful online learning, few studies have investigated online instructors' leadership behaviors. This study offers new insights into the conceptual and empirical alignment between instructor leadership, as interpreted through the dual lenses of organizational leadership theory and the Community of Inquiry (CoI) framework, proposing instructor leadership as foundational to the teaching and learning experience in a CoI. Specifically, the convergent mixed methods study investigated students' (N = 87) and instructors' (N = 7) perceptions of instructor servant leadership (SL) behaviors in an online graduate-level course designed to facilitate a CoI. Results demonstrate instructor SL behaviors were perceived differently by students and instructors, instructors' self-perceptions were generally higher than students' perceptions, and students' perceptions of instructor SL were positively correlated with their satisfaction with the course and instructor. Implications offer insights into instructor leadership behaviors important for developing instructor leadership presence to facilitate meaningful learning and student satisfaction in higher education online learning.

Keywords: higher education online learning, community of inquiry, instructor leadership, servant leadership, student satisfaction

Introduction

Teaching online differs from face-to-face teaching (Hung & Chou, 2015; Stavredes, 2011), and pedagogical practices are important to consider when examining instructor and student challenges (Richardson et al., 2016; Stavredes, 2011). Instructors often have limited experience, preparation, and guidance for online teaching (Lowenthal et al., 2019; Richardson et al., 2015). Students face challenges such as isolation, struggles with content, and lack of immediate feedback (Richardson et al., 2015). As higher education institutions continue to increase online courses to use resources more efficiently, reach more students, and increase diversity (Beaudoin, 2015), instructors who can effectively employ evidence-based practices in online pedagogy to improve students' educational experiences, satisfaction, and retention in online programs are needed (Muljana & Luo, 2019; Stavredes, 2011).

Instructor leadership has been conceptualized as an essential pedagogical competency in higher education online learning (HEOL) (Farmer & Ramsdale, 2016; Garrison, 2017). Research in the discipline of instructional communications has long supported the connection between leadership and teaching (Chory & McCroskey, 1999). Since Chory and McCroskey's (1999) investigation of teacher management communication style and students' affective learning, scholars have investigated the relationships among leadership theories and student outcomes. Balwant's (2016) meta-analytic review, for example, included 22 studies on student outcomes related to instructor transformational leadership.

Drawing on organizational leadership theory, Balwant (2016) defined instructor leadership as "a process whereby instructors exert intentional influence over students to *guide, structure, and facilitate* [emphasis added] activities and relationships" (p. 21). Similarly, the Community of Inquiry (CoI) framework, a conceptual model for investigating HEOL, described teaching presence as "the *design, facilitation, and direction* [emphasis added] of cognitive and social processes for the purpose of realizing meaningful and educationally worthwhile learning outcomes" (Anderson et al., 2001, p. 5). Instructor leadership and teaching presence are supported by empirical studies that demonstrated positive associations with student outcomes, such as perceived instructor effectiveness, student satisfaction, cognitive and affective learning, motivation, engagement, participation, and perceived learning (Balwant, 2016; Bolkan & Goodboy, 2009; Kucuk & Richardson, 2019; Pounder, 2008; Zhang et al., 2016; Zhang et al., 2022).

While research studies investigating connections between instructor leadership and organizational leadership theories have primarily focused on transformational leadership (Noland & Richards, 2015), servant leadership (SL), a values-based theory that prioritizes follower needs and development, is aligned with the CoI framework. Thus, this study proposes that instructor leadership, interpreted through the lens of SL theory, is the sine qua non of teaching presence in a CoI. The purpose of the study is to investigate instructor leadership through the dual lenses of the COI framework and SL theory to provide empirical evidence to operationalize the construct of instructor leadership in a CoI.

Literature Review

The Community of Inquiry Framework

The CoI framework, the most referenced and empirically supported model for studying HEOL communities (Valverde-Berrocoso et al., 2020), is based on a constructivist perspective of online learning as a social and collaborative community in which instructors and students actively participate in and share responsibility for learning (Garrison, 2017; Garrison & Arbaugh, 2007). The theory conceptualized the types of and interactions among elements necessary for meaningful learning. Garrison et al.'s (2000) seminal article defined social presence (SP), cognitive presence (CP), and teaching presence (TP) as three interdependent elements in a CoI.

The model described SP as social and emotional projection and perception of authentic others in online environments (Garrison & Arbaugh, 2007). Social presence is characterized by open communication, group cohesion, and affective expression and is necessary for collaborative inquiry. Collaborative inquiry is the heart of CP, defined as learners' abilities to construct and confirm meaning through reflection and discourse. Cognitive presence requires TP to help learners develop higher level thinking. Finally, TP integrates social and cognitive processes through design, facilitation, and direction to achieve educational outcomes (Garrison & Arbaugh, 2007).

The ways in which instructors and students engage in online courses have evolved with technology. While early CoI research focused on discussion forums (Archer, 2010), Shea et al. (2010) suggested investigating the presences throughout all course components. Researchers have also proposed many other presences (Kozan & Caskurlu, 2018) and noted a lack of research regarding specific roles of instructors and learners in online learning environments (Shea et al., 2022). Xin (2012) argued that while the model's three presences are useful for analysis, online interactions are not easily categorized. These observations provide a basis for investigating instructor leadership as foundational to TP but also, given the essential nature of TP (Alotebi et al., 2018; Farmer & Ramsdale, 2016; Garrison, 2013, 2017), lead to the possibility that instructor leadership may be foundational to the teaching and learning experience in the CoI framework.

Instructor Leadership and the Community of Inquiry Framework

Balwant's (2016) conception of instructor leadership as an influential process to guide, structure, and facilitate activities and relationships is similar to Garrison et al.'s (2000) conception of TP in a CoI: teaching presence is considered the CoI framework's binding element through which "student activity is influenced" (p. 96) by the teacher "proactively guiding" (p. 102) reflection and discourse, managing "structural concerns" (p. 101), and "facilitat[ing] an educational transaction" (p. 101). Furthermore, TP has been interpreted as "effective instructional leadership" (Szeto, 2015, p. 192) in which formal leadership creates a collaborative learning environment "free of coercion and intimidation" (Garrison, 2013, p. 3). Instructor leadership is "essential to precipitate and purposely focus collaborative inquiry (teaching presence) if educational goals are to be achieved" (Garrison, 2013, p. 4). Swan et al. (2020) noted that the most recent research into TP positioned it as "the key to developing online communities of inquiry" (p. 7). While instructor leadership has been most explicitly aligned with TP, instructor leadership is also important for facilitating the deep and meaningful learning associated with CP (Alotebi et al., 2018) and the shared learning experience essential to SP (Garrison et al., 2000).

Servant Leadership Theory

Researchers have recently applied values-based leadership theories to the study of instructor-student relationships in higher education (Balwant, 2019). This study proposes servant leadership (SL) theory as particularly relevant to instructor leadership in HEOL. Servant leadership is a values-based leadership approach, conceptualized by Greenleaf (e.g., Greenleaf, 1970/2008), in which leaders prioritize followers' needs, goals, and well-being, leading to increased engagement, follower satisfaction, and effective performance (Eva et al., 2019).

While there is not one agreed upon definition of SL (Lemoine & Blum, 2020), scholars have recently conceptualized SL as "an (1) other-oriented approach to leadership (2) manifested through one-on-one prioritizing of follower individual needs and interests, (3) and outward reorienting of their concern for self towards concern for others within the organization and the larger community" (Eva et al., 2019, p. 114). This definition captures the core elements of SL articulated by Greenleaf (1970/2008). Servant leaders take care of others' needs, reflect on their service to others, and recognize and model "leadership for the common good" (Greenleaf, 1970/2008, p. 35). Servant leaders' focus on followers' personal growth and social responsibility (Eva et al., 2019; Van Dierendonck, 2011) also aligns with a CoI, which is "intended to focus on learning experiences that have societal value as well as the ability for the individual to grow and continue learning" (Garrison, 2017, p. 69).

As a relatively new leadership theory, SL has many proposed models. Van Dierendonck (2011) synthesized seven models into six key characteristics; only Laub's (1999) captured all six (Table 1).

Table 1

Comparing Servant Leadership (SL) Characteristics

Laub's SL characteristics (1999)	Van Dierendonck's SL characteristics (2011)
Values people	Interpersonal acceptance
Develops people	Empowering and developing people
Builds community	Stewardship
Displays authenticity	Authenticity
Provides leadership	Providing direction
Shares leadership	Humility

Laub (1999) was among the first to provide an operational definition of SL based on empirical data (Van Dierendonck, 2011), and his is one of the most cited SL definitions (Parris & Peachey, 2013). Laub's (1999) conceptual model, developed through an extensive literature search and Delphi study including 14 experts, consisted of 18 observable SL behaviors aligned with the six proposed characteristics (Table 2). Laub's (1999) SL behaviors provided the foundation for examining instructor leadership in this study.

Table 2

Servant Leader Characteristics and Behaviors

Servant leader characteristics	Servant leader behaviors
Values people	By believing in people
	By serving others' needs before his or her own
	By receptive, non-judgmental listening
Develops people	By providing opportunities for learning and growth
	By modeling appropriate behavior
	By building up others through encouragement and affirmation
Builds community	By building strong personal relationships
	By working collaboratively with others
	By valuing the differences of others
Displays authenticity	By being open and accountable to others
	By a willingness to learn from others
	By maintaining integrity and trust
Provides leadership	By envisioning the future
	By taking initiative
	By clarifying goals
Shares leadership	By facilitating a shared vision
	By sharing power and releasing control
	By sharing status and promoting others

Note. Adapted from "Assessing the servant organization: Development of the organizational leadership assessment (OLA) instrument," by J.A. Laub, 1999, Florida Atlantic University, ProQuest Dissertations Publishing, p. 83. Copyright 1999 by James A. Laub.

Servant Leadership and Higher Education Learning

Multiple studies have made conceptual connections between SL and higher education learning environments. Buchen (1998) conceptualized SL as critical to collaborative faculty-student relationships. Kondrasuk and Bernard (2013) made similar connections, applying Spears's (2002) tenets of SL to higher education, noting that at its core, servant teaching represents a commitment to student-centered learning, impacting course design, instructional practices, and assessment.

Studies also provide empirical connections between SL and higher education learning. In face-to-face settings, undergraduate students perceived more SL behaviors in their most effective professors (Drury, 2005). McCann and Sparks (2018) found significant positive relationships between students' perceptions of SL characteristics and instructional quality. Among undergraduate students, SL qualities in an instructor were positively correlated with learning and engagement (Noland & Richards, 2015). In one of the few studies focused on HEOL, Sahawneh and Benuto (2018) found a strong positive correlation between instructor SL and students' instructor satisfaction in an online community college course.

Synthesizing calls for research in SL and CoI literature, this study contends that to better understand leadership in a CoI, there is a need for research that (a) explores characteristics (Garrison & Arbaugh, 2007; Rebeor et al., 2019; Richardson et al., 2015) and behaviors (Hung & Chou, 2015) of instructors in a CoI; (b) considers instructor and student perceptions of instructor presence in a CoI (Richardson et al., 2015); (c) includes multiple rater comparisons in SL studies (Eva et al., 2019); and (d) compares instructor and student SL perspectives (Sahawneh & Benuto, 2018). This study addressed the following research questions.

In an online course designed to facilitate a Community of Inquiry:

- What are students' perceptions of their online instructor's servant leadership behaviors?
- What are online instructors' self-perceptions of their servant leadership behaviors?
- How do instructors' self-perceptions compare to students' perceptions of their instructor's servant leadership behaviors?
- How do students' perceptions of their instructor's servant leadership behaviors correlate with students' satisfaction with the course and instructor?
- What insights do students' and instructors' survey comments add to the quantitative survey results?

Methodology

This convergent mixed methods study examined instructor SL behaviors within a CoI. In a convergent design, researchers collect quantitative and qualitative data and merge the results to make comparisons and develop a clearer understanding of the phenomenon than may be possible through either data type alone (Creswell & Plano Clark, 2018). Specifically, this study employed descriptive statistics and correlation analyses to investigate numerical survey data and thematic analysis to analyze participants' open-ended survey responses, adding insights to the quantitative results.

Context and Participants

Data for the study were gathered from an eight-week online advanced instructional design course that is part of a learning design and technology master's degree program in the college of education at a large, public Midwestern university. The course was purposefully selected for its intentional design to facilitate a

CoI focused on collaborative, constructivist engagement and instructor leadership to facilitate the course's case-based learning approach. This study examined instructors ($N = 7$) who taught seven different sections of the course and their respective students ($N = 87$) during the fall 2019 semester. The student and instructor response rates were 91% and 100%, respectively. Five female and two male instructors had doctoral degrees in a curriculum and instruction-related area and were experienced teaching online courses. Students were primarily working professionals (95%) with teachers/instructors making up the largest percentage (38%), followed by those in instructional design or other training roles (36%). The remainder (21%) worked in non-instructional educational roles, corporate settings, or other fields. All students had taken previous online courses in the degree program. The female to male ratio of students was approximately 3:1, but this varied in each course section.

Data Sources and Analysis

Two researcher-developed surveys consisted of an 18-item inventory based on Laub's (1999) SL behaviors (Table 2) to measure student perceptions and instructor self-perceptions of instructors' SL behaviors. Following approval by the institutional review board, researchers emailed an invitation and survey link to students and instructors during week seven of the course. Students were offered one bonus point on their final grade with no penalty for non-participation. Cronbach's alpha for the 18 survey items was 0.96 for students, 0.93 for instructors, and 0.96 combined, indicating internal consistency among survey items and reliability of the survey in measuring instructor SL behaviors. Two student survey questions measured satisfaction with the course and instructor.

Both surveys included open-ended responses. Forty-eight percent ($n = 42$) of students and 57% ($n = 4$) of instructors included commentary. The mean perception of instructors' SL behaviors was similar in the group of students who added comments ($M = 4.23$) and students who did not add comments ($M = 4.16$). The four instructors who added comments represented a range of self-perceptions, from the highest ($M = 4.94$) to the lowest ($M = 3.78$) and two in between ($M = 4.72$, $M = 4.50$).

Results of student and instructor surveys were reported using descriptive statistics. The relationships between students' aggregate instructor SL ratings and student satisfaction ratings of the course and instructor were analyzed using Spearman correlations (r_s) at a .05 alpha significance level. Open-ended responses were analyzed using thematic analysis to develop an understanding of and insights about the phenomenon (Boyatzis, 1998). The researchers used a hybrid approach (Fereday & Muir-Cochrane, 2006) in which the participant responses were first analyzed inductively, without regard for the SL behaviors that defined the study, to discover themes across the responses. Following the initial analysis, the resultant themes were categorized deductively according to Laub's (1999) SL behaviors. This process allowed themes to emerge directly from the data and revealed some themes that were important yet would not have been captured through a strictly deductive approach.

Results

Students' and Instructors' Perceptions of Instructor Servant Leadership

Students' perceptions and instructors' self-perceptions of instructor SL behaviors were determined by calculating the means of students' and instructors' ratings across each of the SL behaviors (Table 3).

Table 3

Instructor Servant Leadership Behaviors Rated by Students and Instructors

	Students	Instructors
Instructor behavior	*M* (*SD*)	*M* (*SD*)
Believes in students	4.52 (0.86)	4.71 (0.49)
Puts students' needs before their own	4.06 (1.03)	4.43 (1.13)
Demonstrates receptive and non-judgmental listening	4.50 (0.91)	4.57 (0.79)
Provides opportunities for students' learning and growth	4.45 (0.96)	4.86 (0.38)
Models the kind of behavior they desire from the students	4.24 (1.06)	4.71 (0.49)
Builds students up through encouragement and affirmation[a]	4.30 (1.05)	5.00 (0.00)
Builds strong relationships with students[b]	3.47 (1.10)	4.00 (1.00)
Works collaboratively with students	3.90 (1.07)	4.29 (0.76)
Values differences	4.18 (1.03)	4.71 (0.49)
Displays openness and accountability with students	4.29 (0.96)	4.86 (0.38)
Demonstrates willingness to learn from students	4.10 (1.07)	4.71 (0.49)
Demonstrates integrity and trust[c]	4.57 (0.76)	4.86 (0.38)
Helps students envision their futures	3.80 (1.14)	4.71 (0.49)
Takes initiative in leading	4.34 (0.05)	4.71 (0.49)
Clarifies goals	4.24 (1.06)	4.71 (0.49)
Helps students understand the value of the course	4.06 (1.23)	4.86 (0.38)
Shares power and decision-making about activities and outcomes	4.06 (1.21)	4.29 (1.11)
Facilitates and promotes students' leadership	4.43 (0.90)	4.86 (0.38)

Note. [a]Highest average rating, instructors. [b]Lowest average rating, instructors and students. [c]Highest average rating, students.

Students' Perceptions

Students rated most highly the statement, "In this course, my instructor demonstrates integrity and trust" (*M* = 4.57, *SD* = 0.76). Students noted instructors displayed "candor, transparency, and wise counsel," demonstrated "being attentive to the discussion," and maintained "a high level of professionalism." Students also perceived, "My instructor demonstrates that he/she believes in the students in this course" (*M* = 4.52, *SD* = 0.86). One student said, "[The instructor] speaks to us as students, future IDers [instructional designers], and human beings . . . [They] helped me think that I can do this!" Others

expressed instructors' support of their frustrations, respect for students' thinking, and involvement in discussions to foster student agency. Finally, "My instructor demonstrates receptive and non-judgmental listening in this course" (M = 4.50, SD = 0.91) was also highly perceived by students. Students observed their instructor was "always willing to take the time to answer my numerous questions," and "I never was made to feel I was asking a silly question."

The least perceived behavior was "My instructor builds strong relationships with the students in this course" (M = 3.47, SD = 1.10). One student expressed, "it's not always appropriate to build what I would call a strong relationship." Other students commented, "it seemed like our instructor was absent" and "I have not developed a real relationship . . . due to the fast timeline and distance nature of the course."

Qualitative data also illuminated student perspectives about the quality, quantity, and timeliness of instructor feedback. One student commented, "the instructor is very thorough in reviewing our work with detailed feedback." Another noted their instructor's use of video feedback was "a different and respectable approach to providing an insight to how we are doing," but also thought rubrics would have been more informative. Multiple students mentioned timely feedback, such as "quick, helpful responses to questions." Negative comments included a need for "more personalized feedback," "critiques or confirmation," and "feedback on how to improve."

Instructors' Perceptions

Instructors rated themselves highest on building students up through encouragement and affirmation (M = 5.00, SD = 0.00). One instructor encouraged students by relating to similar life experiences: "I have been in their shoes before." They also commented they "provide a lot of encouragement via email." Another instructor referenced discussion board engagement: "I often either praise or (gently!) challenge student contributions after summarizing them."

Like students, instructors perceived integrity and trust as one of the most important behaviors (M = 4.86, SD = 0.38). One instructor commented, "My goal is to project trust as a leader by offering a routine built on best practices. No surprises if possible." Instructors also agreed least with the statement, "I build strong relationships with the students in this course" (M = 4.00, SD = 1.00). One instructor noted, "I feel that I get to show more leadership qualities to students who reach out to me regularly via email. It is easier to get know students at a more personal level when there's regular off-Blackboard interactions."

Of the four instructors who offered comments, all indicated course design influenced leadership behaviors. For example, errors cause instructors to "lose credibility . . . Students are less likely to trust the course content and instructor. The leadership quotient goes down." One instructor commented the highly structured course left "very little wiggle room . . . This makes agency hard to actuate."

Other instructor comments focused on time constraints: "In eight-week courses, time is a factor that sometimes hinder[s] the demonstration of leadership behaviors." Time was also a course-specific issue: "There is so much involved in this course, I was not able to get into the discussion boards as often as I would have liked." Finally, instructors mentioned experience as a constraint: "I think it will be better the next time I teach the course since I'll have experience under my belt," and "I am hindered by the lack of experience with any other course like this for the students."

Comparing Students' and Instructors' Perceptions

Students' perceptions and instructors' self-perceptions of instructor SL behaviors were determined by calculating the aggregate mean of student and instructor ratings (Table 4).

Table 4

Descriptive Statistics of Student and Instructor Responses by Course Section

Instructor	*N*	*M* (*SD*) Student	*M* (*SD*) Instructor
All	87	4.19 (0.79)	4.66 (0.42)
Inst1	13	4.64 (0.48)	3.78
Inst2	14	4.50 (0.44)	4.94
Inst3	15	4.06 (0.87)	4.83
Inst4	12	4.31 (0.64)	4.94
Inst5	10	3.81 (1.21)	4.89
Inst6	12	4.11 (0.68)	4.50
Inst7	11	3.79 (0.82)	4.72

Apart from Inst1, instructors' self-perceptions were higher on average than students' perceptions. While one instructor noted, "I post my announcements three times a week on the same days and around the same time . . . Consistency and predictability can be reassuring for students," a student perceived the instructor's behaviors differently: "I don't feel like the instructor has had much of a presence in this course. Just about the only interaction I have with [them] is reading email announcements and grading rubrics." Another instructor positively viewed their engagement in online discussions: "Interesting to think about what 'listening' looks like in an online format. I can only assume that it should involve a lot of summarizing and paraphrasing what students have said to show that you're paying attention." However, a student in the same section commented that in discussions, "the instructor was posting tons and tons of responses. This made it harder for me to participate . . . It felt like there was nothing left that I could contribute."

Despite differences, there were also cases in which instructors' and students' perceptions were similar. One instructor commented on the importance of keeping students informed: "I think the key is to prep the students for what's coming up . . . Not having that class road map . . . unsettles some students." This was echoed by a student: "[The instructor] provides updates and reminders throughout the course that make it easy to keep on top of things."

Inst1 had the highest student perception of SL (M = 4.64, SD = 0.48) and lowest self-perception (M = 3.78). This instructor commented that course constraints limited their ability to demonstrate leadership behaviors. Students in the course, however, shared a different perspective. One noted, "[They lead] by being with us. I appreciate that." Another stated, "I appreciate seeing [them] joining in with us in being curious and pondering." Conversely, Inst5 had the largest mean difference between student perception (M = 3.81,

SD = 1.21) and self-perception (*M* = 4.89). While this instructor did not offer comments, student comments reflected dissatisfaction with clarity in expectations, responsiveness, and timeliness of feedback.

Perceptions of Instructor Servant Leadership and Student Satisfaction

The two satisfaction questions in the student survey were analyzed using Spearman's rho (r_s) to determine the correlation between students' satisfaction with the instructor and course and perceptions of instructors' SL behaviors (Table 5).

Table 5

Servant Leadership (SL) and Student Satisfaction With Course and Instructor

Instructor	N	*M* (*SD*) SL	*M* (*SD*) Course Satisfaction	*M* (*SD*) Instructor Satisfaction	r_s SL/ Course	r_s SL/ Instructor
All	87	4.19 (0.79)	3.90 (1.19)	4.22 (1.03)	0.70*	0.75*
Inst1	13	4.64 (0.48)	4.46 (0.88)	4.92 (0.28)	0.41***	0.47***
Inst2	14	4.50 (0.44)	4.64 (0.50)	4.36 (0.63)	0.69**	0.67**
Inst3	15	4.06 (0.87)	3.33 (1.23)	4.27 (0.80)	0.57***	0.61***
Inst4	12	4.31 (0.64)	4.17 (1.19)	4.67 (0.65)	0.58***	0.82**
Inst5	10	3.81 (1.21)	3.70 (1.49)	3.40 (1.51)	0.82**	0.93*
Inst6	12	4.11 (0.68)	3.67 (1.16)	3.92 (1.24)	0.76**	0.77**
Inst7	11	3.79 (0.82)	3.18 (1.17)	3.73 (1.19)	0.89*	0.90*

*$p < .001$. **$p < .01$. *** $p < .05$.

Results of the Spearman correlation indicated significant and moderately strong positive associations between students' mean rating of instructors' SL behaviors and course satisfaction ($r_s(87) = .70$, $p < .001$) and instructor satisfaction ($r_s(87) = .75$, $p < .001$). Correlation analyses within each instructor's section also indicated moderate to strong positive associations between students' mean rating of their instructor's SL behaviors and satisfaction.

Discussion and Implications

This study used the dual-theoretical lenses of the Community of Inquiry (CoI) framework and servant leadership (SL) theory to conceptualize and investigate instructor leadership in a collaborative, constructivist higher education online learning (HEOL) environment. The results extend previous research, investigating characteristics (Garrison & Arbaugh, 2007; Rebeor et al., 2019; Richardson et al., 2015) and behaviors (Hung & Chou, 2015) of instructors in a CoI and comparing students' and instructors' perceptions of instructor SL (Eva et al., 2019; Sahawneh & Benuto, 2018). Results offer insights into instructor leadership behaviors important for developing instructor presence to facilitate meaningful learning and student satisfaction in HEOL.

Students' Perceptions of Instructors' Servant Leadership Behaviors

Students' most highly rated perceptions of instructors' SL behaviors were instructors' demonstration of integrity and trust and receptive, non-judgmental listening, while the least perceived was building strong relationships with students. This difference is interesting, as integrity, trust, and listening are important aspects of interpersonal relationships. In a CoI, however, the instructor-student relationship is shorter than the leader-follower relationship in professional settings. While integrity, trust, and listening remain important, students may not perceive these as characteristics of a strong relationship with their instructor.

Research indicates online instruction requires instructional and communication strategies in which many instructors lack explicit training and experience (Lowenthal et al., 2019). In a CoI, feedback, as a form of instructor-student communications (Richardson et al., 2016), is critical for students' growth and development. Comments from students in this study emphasized the importance of quality, quantity, and timeliness of instructor feedback. While one instructor's students appreciated video feedback, students also desired more details. Thus, instructors should consider using variable feedback strategies to enhance their leadership presence.

Instructors' Self-Perceptions of Servant Leadership Behaviors

Instructors' most highly rated self-perception of their SL behaviors was providing encouragement and affirmation. While some valued individual communications, others encouraged students more visibly through discussion forums, announcements, and video. This finding substantiates CoI research indicating that instructors have different perspectives about what type of presence is most meaningful (Richardson et al., 2016). However, visibility of leadership behaviors can influence followers' perceptions (Lee & Carpenter, 2018). Leaders have the most information about their own behaviors, while others see behaviors through select interactions. In a CoI, instructors should ensure their presence is broadly visible to students (Shea et al., 2010). While individual engagement is important, using technology to incorporate more broadly observed behaviors may improve instructors' leadership presence in a CoI.

Instructors' comments indicated teaching a course they did not design constrained their leadership. This aligns with CoI research indicating that non-designer instructors "felt restricted or frustrated, in part due to the lack of flexibility or level of customization they could bring to the course" (Richardson & Kozan, 2016, p. 93). However, other research has indicated that despite this constraint, instructors find ways to personalize their presence (Richardson et al., 2016). Laub's (1999) SL behaviors and the CoI framework (Garrison et al., 2000) include authenticity as an important element. Thus, while non-designer instructors may not have control over core course elements, Dennen and Arslan (2022) offer an extensive list of ways online instructors can establish an instructor persona through written, visual, and symbolic cues that may help instructors visibly demonstrate leadership in a course.

Comparing Perceptions of Servant Leadership Behaviors

In this study, six of seven instructors' self-perceptions of their SL behaviors were higher than students' perceptions. Leadership studies have demonstrated that leaders who overestimate their leadership behaviors may be perceived as less effective, while leaders who underestimate themselves may be perceived as more effective (Aarons et al., 2017). This study supports that contention, as students had a higher perception of SL behaviors in the instructor who rated themselves lowest (Inst1), while the greatest mean

difference in student and instructor perceptions occurred with instructors who had the two lowest student perceptions of instructor SL behaviors (Inst7 and Inst5).

Servant leaders may underestimate their leadership behaviors because of their awareness of their own and others' perceptions (Powers & Moore, 2005; Van Dierendonck, 2011). Servant teachers are self-reflective practitioners who seek feedback and view their performance with a growth mindset (Powers & Moore, 2005). Comments from Inst1's students reflected behaviors aligned with servant teaching, and their students reported the highest instructor satisfaction. Outcomes from this study suggest the use of student and instructor leadership assessments may help instructors become aware of and understand their leadership behaviors, which can facilitate effective instructional practices and increase student satisfaction.

Students' Course and Instructor Satisfaction

As previously noted, Inst1 had the highest student perception of SL behaviors and the greatest measure of student satisfaction. Comments from students in this section focused on their positive perception of the instructor's presence in the course, while in other sections, students desired increased instructor presence. Interestingly, one student in Inst1's section noted the instructor contributed too much in discussions, limiting their ability to participate. Stavredes (2011) cautioned that too much instructor presence may discourage student engagement. This is supported in Shea et al.'s (2010) social network analysis in which students perceived higher TP in the instructor who contributed fewer but more instructional posts. This insight suggests instructors should carefully balance instructional quality and quantity of contributions to enhance their leadership presence.

Findings in this study align with literature in the CoI framework (e.g., Boston et al., 2019) and SL theory (Eva et al., 2019) that demonstrated correlations between the theoretical frameworks and satisfaction. This held true for satisfaction with the course and instructor. Student satisfaction has been positively associated with persistence in online courses (Weidlich & Bastiens, 2018). Given that this study demonstrated strong positive correlations between instructor SL and student satisfaction, developing instructors' SL skills is one potential way to help increase satisfaction in online courses.

Insights From Students' and Instructors' Comments

Instructor and student comments provided insights about leadership in CoIs. Most relevant were comments about building strong relationships, students' comments about instructor feedback, and instructors' comments about course design. These comments underscore contextual and interpersonal differences between a CoI and an organizational setting regarding leadership behaviors. Thus, measures developed to assess organizational SL may not fully translate to educational settings (Balwant, 2016). This does not mean, however, that instructors do not exhibit SL behaviors, but evaluation instruments should carefully consider contextual differences.

Conclusion

This convergent mixed methods study is based upon findings from one institution's eight-week online graduate-level instructional design course designed to facilitate a Community of Inquiry (CoI). Findings

may not apply to different educational levels, disciplines, instructional approaches, or durations. While the study focused on instructor behaviors, factors such as course design, instructor experience, and instructor-specific characteristics may influence instructors' behaviors; these factors were beyond the scope of this study. Finally, data were collected from a small sample and based on one instrument.

Findings and limitations lead to several recommendations for future research. First, this study is aligned with research that positions leadership as an essential element of a CoI (Alotebi et al., 2018; Farmer & Ramsdale, 2016; Garrison, 2013, 2017). More studies are needed to better understand how to develop effective online instructor leadership behaviors. Case studies may be particularly relevant to investigate instructors' leadership perceptions and in-course actions.

Second, while this study demonstrated alignment between servant leadership (SL) and the CoI framework, future studies are needed to advance understanding of how SL is related to interactions among cognitive, social, and teaching presences. Quantitative correlational studies may be useful to investigate the relationships between specific dimensions of SL and the CoI presences and understand the strength of these relationships. While a growing body of research exists regarding instructor presence (e.g., Collins et al., 2019; Oyarzun et al., 2018; Richardson et al., 2015; Stavredes, 2011), investigating the concept using a leadership framework can provide insights useful for instructors' pedagogical practices. Finally, this study showed moderate to strong correlations between instructor SL and student satisfaction. Future studies using larger sample sizes, different disciplines, and different educational levels may help determine whether this correlation exists beyond the specific sample in this study.

References

Aarons, G. A., Ehrhart, M. G., Torres, E. M., Finn, N. K., & Beidas, R. S. (2017). The humble leader: Association of discrepancies in leader and follower ratings of implementation leadership with organizational climate in mental health. *Psychiatric Services, 68*, 115–122. https://doi.org/10.1176/appi.ps.201600062

Alotebi, H., Alharbi, O., & Masmali, A. (2018). Effective leadership in virtual learning environments. *International Journal of Information and Education Technology, 8*(2), 156–160. https://doi.org/10.18178/ijiet.2018.8.2.1026

Anderson, T., Liam, R., Garrison, D. R., & Archer, W. (2001). Assessing teaching presence in a computer conferencing context. *Journal of Asynchronous Learning Networks, 5*(2), 1–17. https://doi.org/10.24059/olj.v5i2.1875

Archer, W. (2010). Beyond online discussions: Extending the community of inquiry framework to entire courses. *Internet and Higher Education, 13*, 69. https://doi.org/10.1016/j.iheduc.2009.10.005

Balwant, P. T. (2016). Transformational instructor-leadership in higher education teaching: A meta-analytic review and research agenda. *Journal of Leadership Studies*, *9*(4), 20–42. https://doi.org/10.1002/jls.21423

Balwant, P. T. (2019). "Keeping it real" authentic instructor-leadership, student engagement and performance, and leader distance. *International Journal of Leadership in Education*, *25*(1), 39–65. https://doi.org/10.1080/13603124.2019.1657593

Beaudoin, M. F. (2015). Distance education leadership in the context of digital change. *The Quarterly Review of Distance Education, 16*(2), 33–44. https://go.gale.com/ps/i.do?p=AONE&u=googlescholar&id=GALE|A437059683&v=2.1&it=r&sid=AONE&asid=f1bdb7d7

Bolkan, S., & Goodboy, A. K. (2009). Transformational leadership in the classroom: Fostering student learning, student participation, and teacher credibility. *Journal of Instructional Psychology*, *36*(4), 296–306. https://psycnet.apa.org/record/2010-01017-003

Boston, W., Diaz, S. R., Gibson, A. M., Ice, P., Richardson, J., & Swan, K. (2019). An exploration of the relationship between indicators of the community of inquiry framework and retention in online courses. *Journal of Asynchronous Learning Networks, 14*(1), 3–19. https://files.eric.ed.gov/fulltext/EJ862358.pdf

Boyatzis, R. (1998). *Transforming qualitative information: Thematic analysis and code development*. Sage Publications.

Buchen, I. H. (1998). Servant leadership: A model for future faculty and future institutions. *The Journal of Leadership Studies, 5*(1), 125–134. https://doi.org/10.1177/107179199800500111

Chory, R. M., & McCroskey, J. C. (1999). The relationship between teacher management communication style and affective learning. *Communication Quarterly, 47*(1), 1–11. https://doi.org/10.1080/01463379909370120

Collins, K., Groff, S., Mathena, C., & Kupczynski, L. (2019). Asynchronous video and the development of instructor social presence and student engagement. *Turkish Journal of Distance Education, 20*(1), 53-70. https://doi.org/10.17718/tojde.522378

Creswell, J. W., & Plano Clark, V. L. (2018). *Designing and conducting mixed methods research* (3rd ed.). Sage Publications, Inc.

Dennen, V. P., & Arslan, O. (2022). The visual performance of online identity: Instructor presence and persona across tools and settings. *Studies in Technology Enhanced Learning, 2*(1), 13-30. https://doi.org/10.21428/8c225f6e.9e975efc

Drury, S. (2005, August). Teacher as servant leader: A faculty model for effectiveness with students. In *Servant Leadership Research Roundtable*. Symposium conducted at School of Leadership Studies, Regent University. http://www.drurywriting.com/sharon/drury_teacher_servant.pdf

Eva, N., Robin, M., Sendjaya, S., Van Dierendonck, D., & Liden, R. C. (2019). Servant leadership: A systematic review and call for future research. *The Leadership Quarterly, 30*(1), 111–132. https://doi.org/10.1016/j.leaqua.2018.07.004

Farmer, H. M., & Ramsdale, J. (2016). Teaching competencies for the online environment. *Canadian Journal of Learning and Technology, 42*(3), 1–17. https://doi.org/10.21432/T2V32J

Fereday, J., & Muir-Cochrane, E. (2006). Demonstrating rigor using thematic analysis: A hybrid approach of inductive and deductive coding and theme development. *International Journal of Qualitative Methods,5*(1), 80–92. https://doi.org/10.1177/160940690600500107

Garrison, D. R. (2017). *E-Learning in the 21st century: A community of inquiry framework for research and practice* (3rd ed.). Routledge.

Garrison, D. R., Anderson, T., & Archer, W. (2000). Critical inquiry in a text-based environment: Computer conferencing in higher education. *The Internet and Higher Education, 11*(2), 1–14. https://doi.org/10.1016/S1096-7516(00)00016-6

Garrison, D. R., & Arbaugh, J. B. (2007). Researching the community of inquiry framework: Review, issues, and future directions. *The Internet and Higher Education*, *10*(3), 157-172. https://doi.org/10.1016/j.iheduc.2007.04.001

Garrison, D. R., & Cleveland-Innes, M. (2005). Facilitating cognitive presence in online learning: Interaction is not enough. *The American Journal of Distance Education, 19*(3), 133-148. https://doi.org/10.1207/s15389286ajde1903_2

Greenleaf, R. K. (2008). *The servant as leader*. The Robert K. Greenleaf Center. (Original work published 1970).

Hung, M., & Chou, C. (2015). Students' perceptions of instructors' roles in blended and online learning environments: A comparative study. *Computers & Education, 81*, 315–325. https://doi.org/10.1016/j.compedu.2014.10.022

Kondrasuk, J., & Bernard, E. (2013). A better approach to college teaching? *Journal of Innovative Education Strategies, 2*(1), 1–17. https://pilotscholars.up.edu/bus_facpubs/26

Kozan, K., & Caskurlu, S. (2018). On the nth presence for the community of inquiry framework. *Computers & Education, 122*, 104–118. https://doi.org/10.1016/j.compedu.2018.03.010

Kucuk, S., & Richardson, J.C. (2019). A structural equation model of predictors of online learners' engagement and satisfaction. *Online Learning*, *23*(2), 196–216. https://doi.org/10.24059/olj.v23i2.1455

Laub, J. A. (1999). *Assessing the servant organization: Development of the organizational leadership assessment (OLA) instrument* (Publication No. 9921922) [Doctoral dissertation, Florida Atlantic University]. ProQuest Dissertations Publishing. https://www.servantleaderperformance.com/wp-content/uploads/2018/04/1999-Laub-Dissertation.pdf

Lee, A., & Carpenter, N. C. (2018). Seeing eye to eye: A meta-analysis of self-other agreement of leadership. *The Leadership Quarterly, 29*(2), 253–275. https://doi.org/10.1016/j.leaqua.2017.06.002

Lemoine, G. J., & Blum, T. C. (2020). Leadership and servant leadership: Understanding both by bridging the past and present. In J. C. Burkhardt & J. Y. Joslin (Eds.), *Inspiration for servant-leaders: Lessons from fifty years of research and practice* (pp. 1–45). The Greenleaf Center for Servant Leadership.

Lowenthal, P. R., Shreaves, D., Gooding, M., & Kepka, J. (2019). Learning to teach online: An exploration of how universities with large online programs train and develop faculty to teach online. *Quarterly Review of Distance Education, 20*(3), 1–51. https://eric.ed.gov/?id=EJ1246512

McCann, J., & Sparks, B. (2018). The relationship of servant leadership in the classroom and student perceptions of university quality of instruction. *Archives of Business Research, 6*(6),119–133. https://doi.org/10.14738/abr.66.4167

Muljana, P. S., & Luo, T. (2019). Factors contributing to student retention in online learning and recommend strategies for improvement: A systematic literature review. *Journal of Information Technology Education, 18,* 19–58. https://digitalcommons.odu.edu/stemps_fac_pubs/80

Noland, A., & Richards, K. (2015). Servant teaching: An exploration of teacher servant leadership on student outcomes. *Journal of the Scholarship of Teaching and Learning, 15*(6), 16-38. https://doi.org/10.14434/josotl.v15i6.13928

Oyarzun, B., Barreto, D., & Conklin, S. (2018). Instructor social presence effects on learner social presence, achievement, and satisfaction. *TechTrends, 62*(6), 625-634. https://doi.org/10.1007/s11528-018-0299-0

Parris, D. L, & Peachey, J. W. (2013). A systematic literature review of servant leadership theory in organizational contexts. *Journal of Business Ethics, 113*(3), 377-393. https://doi.org/10.1007/s10551-012-1322-6

Pounder, J. S. (2008). Transformational classroom leadership: A novel approach to evaluating classroom performance. *Assessment and Evaluation in Higher Education, 33*(3), 233-243. https://doi.org/10.1080/02602930701292621

Powers, J. B., & Moore, J. W. (2005). Servant-leadership and the art of teaching. *The International Journal of Servant-Leadership, 1*(1), 123-153. https://gonzaga.azureedge.net/-/media/Website/Documents/Academics/School-of-Leadership-Studies/DPLS/IJSL/Vol-1/IJSL-Vol-1-10-Powers-and-Moore.ashx?rev=68dcd93dc62d4f5cb775ed74c29df662&hash=F1C917D0E87BBC4CCA0844C3936FCF3B

Rebeor, S. M., Rosser-Majors, M. L., McMahon, C. L., Anderson, S. L., Harper, Y., & Sliwinski, L. J. (2019, June). Effective instruction in virtual higher education: Ensuring cognitive, social, and teaching presence. International Conference on Education and New Developments. Porto, Portugal. https://doi.org/10.36315/2019v1end118

Richardson, J. C., Besser, E., Koehler, A., Lim, J., & Strait, M. (2016). Instructors' perceptions of instructor presence in online learning environments. *The International Review of Research in Open and Distributed Learning*, *17*(4). https://doi.org/10.19173/irrodl.v17i4.2330

Richardson, J., Koehler, A., Besser, E., Caskurlu, S., Lim, J., & Mueller, C. (2015). Conceptualizing and investigating instructor presence in online learning environments. *International Review of Research in Open and Distributed Learning, 16*(3), 256–297. https://doi.org/10.19173/irrodl.v16i3.2123

Richardson, J. C., & Kozan, K. (2016). Digging deeper into online communities of inquiry at Purdue: Research-informed insights into theory and practice. In M. Orey & R. M. Branch (Eds.). *Educational Media and Technology Yearbook, Volume 40* (pp. 85–97). Springer. https://doi.org/10.1007/978-3-319-45001-8

Sahawneh, F., & Benuto, L. (2018). The relationship between instructor servant leadership behaviors and satisfaction with instructors in an online setting. *Online Learning Journal, 22*(1), 107. https://doi.org/10.24059/olj.v22i1.1066

Shea, P., Hayes, S., & Vickers, J. (2010). Online instructional effort measured through the lens of teaching presence in the community of inquiry framework: A re-examination of measures and approach. *The International Review of Research in Open and Distributed Learning, 11*(3), 127–154. https://doi.org/10.19173/irrodl.v11i3.915

Shea, P., Richardson, J., & Swan, K. (2022). Building bridges to advance the community of inquiry framework for online learning. *Educational Psychologist, 57*(3), 148–161. https://doi.org/10.1080/00461520.2022.2089989

Spears, L. C. (2002). Tracing the past, present, and future of servant-leadership. In L. C. Spears & M. Lawrence (Eds.), *Focus on leadership: Servant-leadership for the 21st Century* (pp. 1–16). Wiley.

Stavredes, T. (2011). *Effective online teaching: Foundations and strategies for student success*. Jossey-Bass.

Swan, K., Chen, C. C., & Bockmier-Sommers, D. K. (2020). Relationships between Carl Rogers' person-centered education and the community of inquiry framework: A preliminary exploration. *Online Learning Journal, 24*(3), 4–18. https://doi.org/10.24059/olj.v24i3.2279

Szeto, E. (2015). Community of inquiry as an instructional approach: What effects of teaching, social and cognitive presences are there in blended synchronous learning and teaching? *Computers & Education, 81*, 191–201. https://doi.org/10.1016/j.compedu.2014.10.015

Valverde-Berrocoso, J., Garrido-Arroyo, M. C., Burgos-Videla, C., & Morales-Cevallos, M. B. (2020). Trends in educational research about e-learning: A systematic literature review (2009-2018), *Sustainability, 12*(12), Article 5153. https://doi.org/10.3390/su12125153

Van Dierendonck, D. (2011). Servant leadership: A review and synthesis. *Journal of Management, 37*(4), 1228–1261. https://doi.org/10.1177/0149206310380462

Weidlich, J., & Bastiaens, T. J. (2018). Technology matters: The impact of transactional distance on satisfaction in online distance learning. *The International Review of Research in Open and Distributed Learning,19*(3), 222–242. https://doi.org/10.19173/irrodl.v19i3.3417

Xin, C. (2012). A critique of the community of inquiry framework. *The Journal of Distance Education, 26*(1), 1–15. https://www.learntechlib.org/p/88367/

Zhang, H., Lin, L., Zhan, Y., & Ren, Y. (2016). The impact of teaching presence on online engagement behaviors. *Journal of Educational Computing Research, 54*(7), 887–900. https://doi.org/10.1177/0735633116648171

Zhang, Y., Tian, Y., Yao, L., Duan, C., Sun, X., & Niu, G. (2022). Individual differences matter in the effect of teaching presence on perceived learning: From the social cognitive perspective of self-regulated learning. *Computers and Education*, *179*, Article 104427. https://doi.org/10.1016/j.compedu.2021.104427


Athabasca
University


BY

International **R**eview of **R**esearch in **O**pen and **D**istributed **L**earning
Volume 24, Number 2

May – 2023

Is My MOOC Learner-Centric? A Framework for Formative Evaluation of MOOC Pedagogy

Veenita Shah, Sahana Murthy, and Sridhar Iyer
IDP in Educational Technology, IIT Bombay, Mumbai, India

Abstract

MOOCs popularly support the diverse learning needs of participants across the globe. However, literature suggests well-known scepticism regarding MOOC pedagogy which questions the effectiveness of the educational experience offered by it. One way to ensure the quality of MOOCs is through systematic evaluation of its pedagogy with the goal to improve over time. Most existing MOOCs' quality evaluation methods do not account for the increasing significance of learner-centric pedagogy towards providing a richer learning experience. This paper presents a MOOC evaluation framework (MEF), designed with a strong pedagogical basis underpinned by theory and MOOC design practices, which evaluates the integration of learner-centric pedagogy in MOOCs. Using mixed-methods research, the internal validation was conducted through expert reviews (N = 2), and external validation (N = 13) was conducted in the field to test model usability and usefulness. The framework was classified as "good" (SUS: 78.46) in terms of usability. A high perception of usefulness (84%–92%) was observed for the framework as a formative evaluation tool for assessing the integration of learner-centric pedagogy and bringing a positive change in MOOC design. Different participants acknowledged new learning from varied dimensions of the framework. Participants also recognized that the scores obtained using the MEF truly reflected the efforts taken to incorporate learner-centric design strategies in the evaluated dimensions. The framework focuses on learner-centric evaluation of MOOC design with a goal to facilitate improved pedagogy.

Keywords: massive open online course, pedagogical quality of MOOCs, instructional design, quality evaluation methods, formative evaluation of MOOC pedagogy

Introduction

MOOCs have been reported to benefit varied stakeholders, including students, academicians, and corporate professionals (Egloffstein & Ifenthaler, 2017; Konrad, 2017). Additionally, there has been an increase in the acceptance of MOOCs by higher education institutions using varied models (Burd et al., 2015). However, such MOOC initiatives also raise concerns as the quality of learning experience in MOOCs still remains debatable (Lowenthal & Hodges, 2015; Margaryan et al., 2015; Toven-Lindsey et al., 2015). The research points towards known limitations in the design of MOOCs and its insufficiency to cater to the diversity of learners with varied motivations and learning requirements (Hew, 2018; Yousef et al., 2014). This questions the meaningfulness and effectiveness of the educational experience that is offered by MOOCs. Therefore, MOOCs are expected to meet some quality standards in their pedagogical considerations.

Numerous MOOC design guidelines and frameworks in literature enumerate important learning support elements to address the pedagogical quality of MOOCs (Conole, 2013; Hew, 2018; Lee et al., 2016; Pilli & Admiraal, 2017). However, the overall integration of these principles in MOOCs is found to be low in literature (Lowenthal & Hodges, 2015; Margaryan et al., 2015; Watson et al., 2017). This indicates that though there are some guiding pedagogical frameworks and principles, the potential direction towards improving the instructional quality of MOOCs seems to be lacking. A recent literature review on MOOCs' quality also suggested deepening of research in the subject and designing new guidelines that ensure quality (Stracke & Trisolini, 2021).

Since quality is the output of the systematic process of design and evaluation, one way to ensure the quality of MOOCs is through the evaluation of these courses with the goal to improve over time (Alturkistani et al., 2020; Jansen et al., 2017). There are a few existing e-learning quality approaches, some specific to MOOCs, intended to provide a useful overview and guide to certain quality issues (Ossiannilsson et al., 2015). However, most of these methods need to be enriched to effectively evaluate the instructional design in MOOCs implementing active learning pedagogies (Aloizou et al., 2019). This study presents an enhanced learner-centric instructional framework, termed *MOOC Evaluation Framework* (MEF), for MOOC creators or instructors for formative evaluation of their MOOCs in order to improve upon their pedagogical design. In addition, the study evaluates the usability and usefulness of the MEF from the perspective of MOOC creators in the field, their experience with the MEF in terms of new learning, and their perception on its usefulness in evaluating the integration of a learner-centric approach in MOOCs.

Background

Significance of Learner-Centric Approach in MOOCs

Over the years, studies have been presenting strategies such as collaboration, peer interaction, feedback, learner-instructor connection, and so forth to enhance students' engagement, improve academic achievement and lower the attrition rates in MOOCs (Hew, 2018; Pilli & Admiraal, 2017; Yousef et al., 2014). Though the proposed strategies for improvements differ in details, a remarkably consistent theme is the call to emphasise learner-centric instructional strategies such as active learning, problem-centric learning, and instructor accessibility in MOOCs. The learner-centric instructional design encourages

interactions with peers and instructors, and focuses on recurrent learning activities and feedback mechanisms. The approach engages learners to create their own learning experience and become independent and critical thinkers (Bransford et al., 2000).

There exist several MOOC design models and frameworks guiding the development of MOOCs (Conole, 2013; Fidalgo-Blanco et al., 2015; Lee et al., 2016) for enhanced learner experience and quality of MOOCs. A recently presented learner-centric MOOC model for MOOC design also established the role of learner-centric pedagogy in attaining active learner participation and higher completion rates in MOOCs (Shah et al., 2022). However, there is an identified research gap in the quality assurance methods of MOOCs implementing active learning strategies (Aloizou et al., 2019). Most of the existing quality evaluation methods for MOOCs do not account for the increasing significance of learner-centric pedagogy that aims at providing richer learning experience for participants.

Existing Evaluation Measures for MOOCs

Most of the studies which evaluate MOOCs' pedagogy use instructional design principles or some standardized frameworks. This section provides a brief overview on some of these evaluation approaches and a few observations associated with respect to their quality criteria and applications.

Instructional Design and E-Learning Principles

Merrill's first principles of instruction, abstracted from key instructional design theories and models, were supplemented by five additional principles, abstracted from literature (Maragaryan et al., 2015; Merrill, 2002). A MOOC evaluation study presented an analysis of design quality determined from first principles of instruction for 76 MOOCs (Maragaryan et al., 2015). The majority of MOOCs scored poorly on most instructional design principles but highly on organisation and presentation of course material. This indicated that although most MOOCs were well-packaged, their instructional design quality was low. A similar evaluation study conducted on 27 open courses, using the first principles of instruction, showed parallel results with poor instructional design of courses (Chukwuemeka et al., 2015). Another study applied Merrill's first principles of instruction to review nine MOOCs and found that the principles were generally well incorporated into the course design (Watson et al., 2017). However, here the evaluation included MOOCs that specifically targeted attitudinal change.

A recent evaluation study conducted on six courses, using Chickering and Gamson's principles (Chickering & Gamson, 1987) and part of the quality online course initiative rubric, showed the need for further enhancement to support active learning in these courses (Yilmaz et al., 2017). Another recent study used Clark and Mayer's e-learning guidelines (Clark & Mayer, 2016) to evaluate the pedagogical design of 40 MOOCs (Oh et al., 2020). The findings of the study indicated a relatively low application of these principles in general, with the exception of those related to the organization and presentation of content. The principles which scored particularly low included practice, worked examples, and feedback.

Standardized Frameworks and Quality Models

Different organisations have come up with a number of standard models or frameworks for quality check of e-learning, with some specifically developed for MOOCs. One of these includes OpenupEd (Rosewell & Jansen, 2014), initiated by the European Association of Distance Teaching Universities (EADTU). This

comprises 11 course-level and 21 institutional-level benchmarks that cover six areas, including strategic management, curriculum design, course design, course delivery, staff support, and student support. Though OpenupEd promotes features that put the learner in the centre, the quick scan should be further fleshed out using a more detailed self-assessment process (Jansen et al., 2017). Another quality assurance model with a similar approach is the European Foundation for Quality in e-Learning (EFQUEL) which operates the UNIQUe certification (Creelman et al., 2014). These models are mainly intended for certification, accreditation, benchmarking, or labelling as a frame of reference (Ossiannilsson et al., 2015).

Read and Rodrigo (2014) also reported a quality model for Spain's National Distance Education University MOOCs; however, it presented high-level guidelines on course design aspects such as topic, reuse of existing content, overall duration, course structure, and so forth. This work was based largely on MOOCs which were adaptations of existing courses to a MOOC format. Quality Matters (QM), though not specifically addressing the context of MOOCs, is another assurance system for evaluating online courses such as MOOCs (Shattuck, 2015). The framework consists of 47 specific criteria with eight general standards. According to a study, none of the six courses reviewed using QM achieved a passing score of 85% (Lowenthal & Hodges, 2015). The study also mentioned the tendency of the framework to heavily focus on the aspects of course design and not enough on instructional approaches for active engagement, communication, and collaboration. Another framework, the Quality Reference Framework (QRF), was developed by the European Alliance for the Quality of MOOCs called MOOQ (Stracke et al., 2018). The framework consists of two quality instruments with action items for potential activities and leading questions to assist in MOOC design and development. It is a generic framework that can be adapted to specific contexts for improving MOOC design, development, and evaluation of created MOOCs (Stracke, 2019). However, no evidence from testing the framework in the field has yet been reported.

Hence, the application of existing instructional design principles often remains limited, and most of the quality evaluation models and frameworks tend towards certification and accreditation with high-level guidelines. A recent study which evaluated three mature quality analysis tools, including the 10-principle framework, the OpenupED, and Quality Matters proposed the need for clear and simple questions, assessing specific elements of the active learning pedagogies to make accurate conclusions about MOOC quality (Aloizou et al., 2019). According to another recent systematic review, one of the least studied aspects of MOOC evaluation of effectiveness is pedagogical practices (Alturkistani et al., 2020). Hence, the goal of our research was to create an evaluation framework which is focused on the pedagogical perspective of MOOC design, with a learner-centric approach at its core.

MOOC Evaluation Framework

The MEF distinguishes itself from other MOOC evaluation measures as it primarily focuses on evaluation of learner-centric pedagogy in MOOC design. Though a few existing frameworks evaluate certain learner-centric components in online courses (Rosewell & Jansen, 2014; Shattuck, 2015; Stracke, 2019), greater emphasis has been observed in constructs such as learning objectives, learning activities, assessment, and so forth with broad guidelines. While broad course guidelines can help evaluate and improve MOOC quality to some extent, they do not address specific pedagogical challenges of poor learner engagement, learner

interaction, collaboration, feedback, and so forth. (Lowenthal & Hodges, 2015; Maragaryan et al., 2015; Oh et al., 2020; Yilmaz et al., 2017). The MEF offers evaluation and guidance on incorporation of learner-centric practices, which have been shown to address some of these pedagogical challenges (Shah et al., 2022). The framework goes beyond a crisp checklist, in the form of questions or high-level recommendations, to provide comprehensive indicators for MOOC creators or reviewers. It also provides an opportunity for formative evaluation of MOOC design in a structured and comprehensive manner. *Formative evaluation*, a term first coined by Scriven (Scriven, 1967), is a process of reviewing pilot stage courses to determine their strengths and weaknesses before the programme of instruction is finalized (Tessmer, 2013). In this setting, formative evaluation through the MEF will allow the instructor to continuously monitor the integration of learner-centric activities during the development phase of the MOOC. It will provide constant feedback and suggest ways to improve through reflective and easy to comprehend design indicators, organised in different dimensions.

Theoretical Basis of the Framework

The MEF is grounded in a number of theoretical approaches. Following the cognitive load theory (Paas & Sweller, 2014; Sweller et al., 2011) and the theory of multimedia learning (Mayer, 2019), the framework evaluates design elements to ensure ease in processing of learning content and reduction in extraneous processing. Cognitivists believe in making the learning process meaningful by organizing the information into structured and smaller chunks. In the context of MOOCs, chunking of concepts into small-length video content with in-video activities makes knowledge meaningful and connects new information with prior knowledge (Shah et al., 2022). Such design interventions related to video content are used by the framework.

Based on constructivist approaches of learning (Mayer, 2019), the MEF evaluates MOOC content for building learner knowledge rather than passive consumption of information. The learning activities are evaluated for promotion of active participation from students where they construct new knowledge based on their prior knowledge. Attention is given to learner diversity, individual differences, and presence of multiple visual representations. The theory of social constructivism (Vygotsky & Cole, 1978) emphasises the importance of social interactions in constructing one's own learning. The framework ensures evaluation of aspects such as peer interactions, collaborative learning, building of learner community, and so forth. Through evaluation of immediate and constructive feedback in learning activities, assignments, and forum tasks, the framework incorporates reflection (Bransford et al., 2000).

The framework incorporates the principle of constructive alignment where curriculum objectives, teaching-learning activities, and assessment tasks are aligned with each other (Biggs, 1999). Moreover, the evaluation criteria are also drawn from the knowledge of first principles of instruction and other research-based practices (Hew, 2018; Margaryan et al., 2015; Merrill, 2002), keeping a focus on learner-centric design.

Scope and Dimensions of the Framework

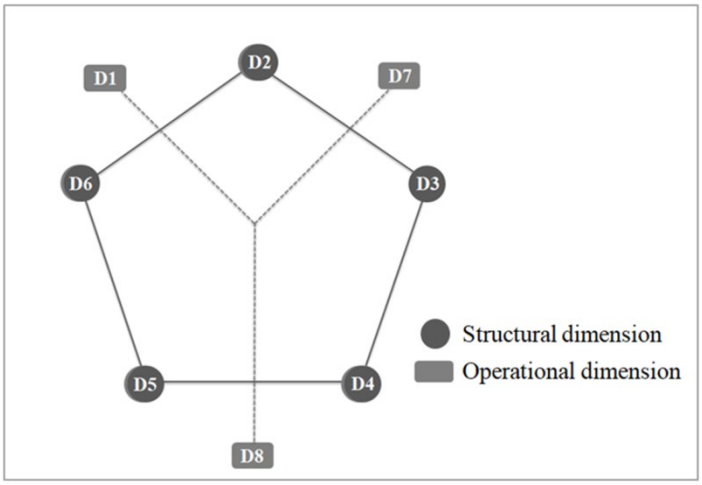
The MEF evaluates the pedagogy design of MOOCs with a learner-centric lens to achieve active learner participation, stronger learner connection with the course content and team, and effective collaboration. The framework focuses on xMOOCs, characterised by structured learning components such as videos, learning activities, assessment, discussion forums, and additional learning resources (Conole, 2013).

Aspects that are out of the scope of this framework include institutional policies and evaluation of technological platforms. Also, it is not designed to evaluate the effectiveness of MOOCs in terms of learning outcomes, learner retention, or learner experience.

The framework organises the integral learning components and pedagogical features of a MOOC into eight dimensions. As shown in Figure 1, the MEF includes five structural dimensions (D2, D3, D4, D5, and D6) and three operational dimensions (D1, D7, and D8). The structural dimensions of the framework are integral learning components for most xMOOCs, while the operational dimensions have evolved in view of the need to keep the course learner-centric in its content, practices and offering.

Figure 1

Types of Dimensions in the MEF



Each dimension further consists of quality criteria related to various aspects of that dimension (Table 1). The goodness of a criterion is described by an array of benchmark indicators, which define the set of actions that need to be fulfilled in order to achieve a high-quality pedagogical design. It is by means of these indicators that the framework aids in formative evaluation of pedagogical features to bring a positive change in MOOC design.

Table 1

List of all Dimensions and Criteria in the MEF

Dimension	Criteria
D1: Course structure and expectations	Course framework and content
	Prerequisites for the course
	Comprehending course components
	Guidelines for learner interactions with content and peers
	Exams and grading policy

	Communication with course team
D2: Video content	Video content appropriateness
	Video chunk length
	Presence of in-video activities
	Purpose of in-video activities
	Positioning and time span of in-video activities
	Feedback on in-video activity and its nature
	Video content presentation
D3: Learning resources	Offering of supplementary learning resources
	Addressing diverse learner needs and interests
	Ensuring learner engagement with resources
D4: Discussion forum	Opportunities and goals of interaction activities on the forum
	Design of peer interaction activities
	Moderator support
	Feedback on forum
	Clear communication
	Integration of technology tools
D5: Synchronous interactions	Opportunities for synchronous interactions
	Purpose of synchronous interactions
	Update on upcoming interaction
	Effective conduct of interaction
	Ease of technology for participation
	Availability of interaction videos
D6: Assessment (formative and summative)	Presence of formative assessment activities
	Frequency of assessment opportunities
	Format of assessment activities
	Pedagogical role of assessment activities
	Feedback on assessment
	Grading of assessment activities

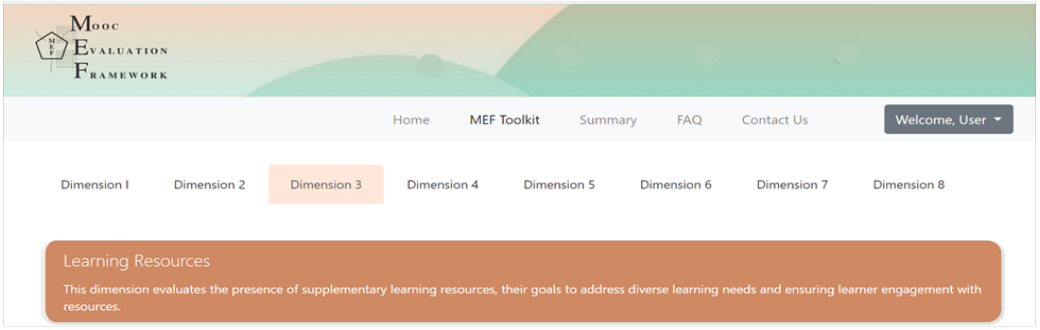
	Grading strategies
D7: Content alignment and integrity	Constructive alignment
	Alignment of technology and pedagogy
	Academic integrity
D8: Learner connection practices	Prompt communication
	Motivating learners
	Support for learner agency
	Community building
	Understanding learner difficulties
	Learner feedback

Scoring a MOOC Using the MEF

The MEF toolkit (https://mef22.github.io/etiitb-vs) supports MOOC evaluation. The toolkit, consisting of 44 criteria configured into eight dimensions, can be employed to perform formative evaluation of a MOOC to gain insights on its pedagogical strengths and weaknesses. An overall judgement can be made on the extent to which a benchmark indicator is achieved. Each indicator is rated on a 4-point scale (missing, inadequate, adequate, or proficient) ranging from 0 to 3, demonstrating the level of performance. Figure 2 illustrates a part of dimension 3, listing two criteria: "Offering of supplementary learning resources" and "Addressing diverse learner needs and interests," with multiple indicators. Some indicators entail numerous items (each denoted by a hyphen). In such cases, the greater the number of items fulfilled, the closer an indicator will be to the proficient level of performance.

Figure 2

Screenshot of the MEF Toolkit Displaying a Part of Dimension 3



Edit | *Enter MOOC Name | Start

		Peformance Levels					
Dimension 3: Learning Resources	**Indicators for evaluation**	**Missing (0)**	**Inadequate (1)**	**Adequate (2)**	**Proficient (3)**	**Indicator Score**	**Avg. Criterion Score**
Offering of supplementary learning resources	The course offers supplementary learning resources for all important content topics to enhance the depth and breadth of learning in varied trajectories	○	○	○	○		
Addressing diverse learner needs and interests	*It is recommended that the learning resources provided be diverse in terms of format and cognitive levels to meet varied learning preferences and goals of diverse learners with varying ability, special needs or other characteristics. The course supports learner needs and interests by:*						
	Providing a variety of curated/created resources in different formats, with appropriate wrappers and rationale, that may include a mix of: -interactive videos -audio resources -book readings or literature papers, infographics -links to advanced specialised courses, seminars, blogs, websites etc. -expert interviews/discussions, educational games, simulations etc.	○	○	○	○		
	Providing resources of different cognitive levels (remedial as well as advanced content) for learners with varying abilities, needs and cognitive interests	○	○	○	○		
	Making it easy for learners to access and understand the content by: -providing text transcripts or captions for non-text or multimedia content -maximizing compatibility with user tools e.g. providing options for different browsers and software -Adjusting the speed of content delivery to accommodate the learning mechanism of diverse learners	○	○	○	○		
	Providing an autonomy to learners to choose their own learning resources from the offered set (e.g. learner is expected to engage with only 1-2 resources out of the set of learning resources offered per week)	○	○	○	○		

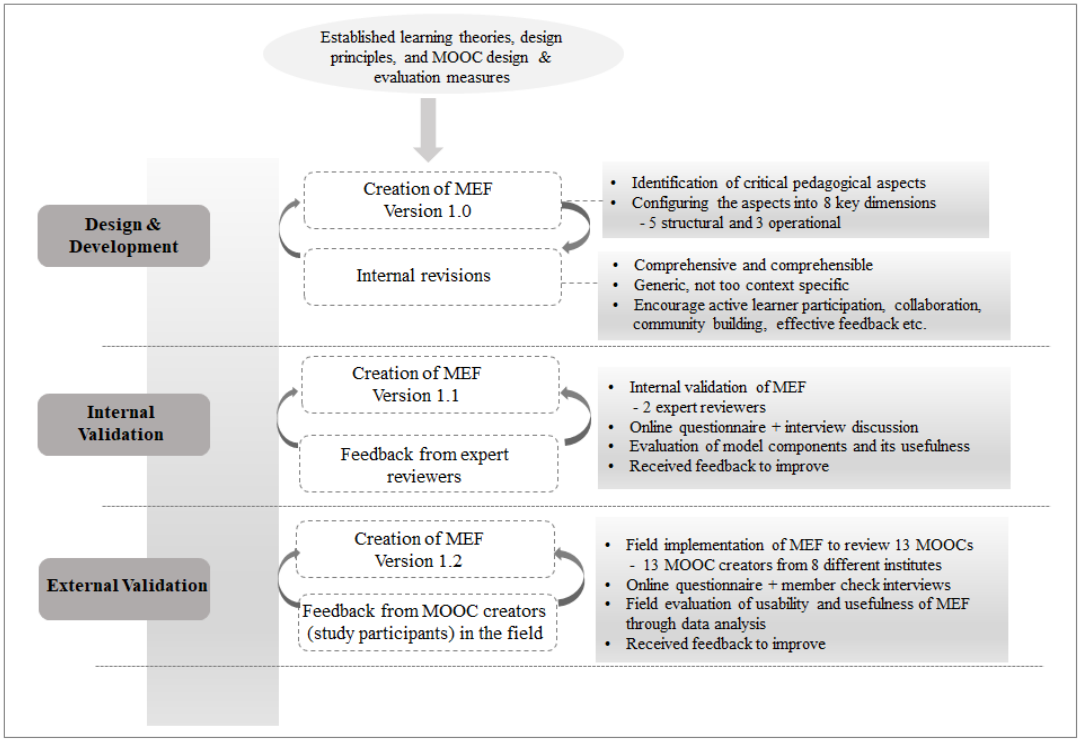
The MEF calculates an average score for every criterion as well as dimension, depending on the user's selection for the corresponding indicators. Based on average dimension score, the user receives feedback which is distributed over 6 score bands: 0–0.9 (*missing or minimal*); 1.0–1.4 (*inadequate*); 1.5–1.9 (*towards adequate*); 2.0–2.4 (*adequate*); 2.5–2.9 (*towards proficient*); 3 (*proficient*). These score bands act as a standard to measure the strength of learner-centric design in a particular dimension. However, the choice of such benchmarks is inevitably arbitrary, and the effects of prevalence and bias on the score must be considered when judging its implication (Sim & Wright, 2005). Hence, even though these scoring bands help in visualizing the interpretation of the obtained score, some amount of individual judgement and circumstances should also be taken into account.

Methodology

A schematic outline of the steps involved in development of the framework and validation studies is shown in Figure 3. A total of 15 MOOC creators, who are responsible for the overall vision, content creation, design, and orchestration of the course, participated in this study. Out of these, two experts conducted the internal validation of the framework. These reviewers had expertise not only in instructional design, but also in model development and learner-centric pedagogy. Thirteen MOOC creators participated in the external validation of the framework. All participants were provided with the MEF toolkit along with detailed guidelines to perform their respective MOOC evaluations. The usability and usefulness of the framework was evaluated through mixed-methods research using quantitative and qualitative analyses, drawing on the strengths of both approaches. The convergent design approach was used for the quantitative and qualitative data collection performed at similar times, followed by an integrated analysis.

Figure 3

Schematic Outline of the Steps in Development and Validation of the MEF



Research Questions

Internal validation studies were performed to evaluate the components and processes of MEF creation, whereas the following three research questions were investigated through the external validation study.

1. How did the MEF perform in terms of usability and usefulness from the perspective of MOOC creators?

2. How was participants' experience during their first encounter with the MEF in terms of new learning and their perception on its potential use in the field?

3. What were participants' reflections on their scores obtained using the MEF in relation to their course pedagogy design?

Study Instruments

Internal Validation

An internal validation study was conducted through expert review using a questionnaire followed by an interview. The questionnaire included questions (10 multiple-choice and nine open-ended questions) about the model components and model use. These questions were designed to address certain factors pertinent

to the character of internal validation (Richey, 2006). In addition, there were questions derived from an instrument created for validating the model theorization process (Lee et al., 2016). These questions attempted to seek answers for 6 items: synthesis of literature for creation of the framework, use of appropriate terminology, comprehensibility, comprehensiveness, validity, and its usefulness. Interviews were conducted to gain thorough understanding of experts' suggestions on certain aspects of the framework.

External Validation

Based on literature recommendation (Richey, 2006), this evaluation study examined the ease of usability and usefulness of the framework through questions which aimed at answering aspects such as: Do MOOC creators find the MEF useful in meeting their MOOC evaluation needs? Why should the MEF be made available/unavailable to MOOC creators for formative evaluation? The questionnaire entailed 13 multiple-choice and eight open-ended questions. Ten multiple-choice questions, derived with slight modification from the original system usability scale or SUS (Bangor et al., 2008), majorly focused on usability of the framework. Remaining questions focused on the strong and weak points of the MEF, with suggestions for improvement, for detailed evaluation of its effectiveness.

Data Analysis

Quantitative Analysis

From the internal validation study, quantitative data of experts' ratings were analysed for content validity index (CVI) and inter-rater agreement (IRA) using earlier methodology (Rubio et al., 2003). In the external validation study, SUS was calculated to determine usability of the framework (Brooke, 1996). The quantitative data received from questionnaire responses on the usefulness of the course was examined by performing frequency analysis from the Likert scale to yield percentages.

Qualitative Analysis

The qualitative data received during interviews with internal validation experts was used as feedback to revise the framework. For the external validation study, the qualitative data provided a detailed description of factors evaluating the ease and complexity in usability and degree of usefulness of the framework. After the questionnaire was completed, member checks were conducted, in the form of interviews, to discuss certain remarks more deeply. Inductive thematic analysis (Braun & Clarke, 2006) of responses was performed to understand and classify participants' perceptions on usability and usefulness of the MEF in evaluating the integration of learner-centric pedagogy in MOOC design.

Results

Internal Validation

Two learner-centric pedagogy experts reviewed the MEF to evaluate six items in order to validate model components and assess its usefulness. The mean for different component scores ranged from 4.5 to 5, with CVI and IRA as 1 in 6 items. Since the CVI and IRA were above 0.8, it suggested strong content validity and

reliability (Rubio et al., 2003). In addition, data from the open-ended questions and interviews with experts was used to make subsequent revisions in the framework, which strengthened it further to Version 1.1.

External Validation

Of the whole group (N = 13), 10 participants were faculty, whereas three were final year PhD students who have been active participants in MOOC creation and offering (Table 2). Participants chosen for this study have created one or more MOOCs, and belonged to eight different recognised educational institutes in India. Thirteen MOOCs from six different disciplines, evaluated in this research using the MEF, were created by study participants in their respective institutions. All participants evaluated their MOOCs in all eight dimensions of the framework.

Table 2

Details of the External Validation Study Conducted on MOOC Creators

Study feature	Details
Participant profile	N = 13
	Number of faculty = 10
	Number of final year PhD scholars = 3
	Number of institutes involved = 8
Evaluated MOOC disciplines	N = 6
	Computer science, instructional design, chemistry, management, analytics, math
Employment of MEF dimensions	All participants used all 8 dimensions for their MOOC evaluation

Usability and Usefulness of the MEF

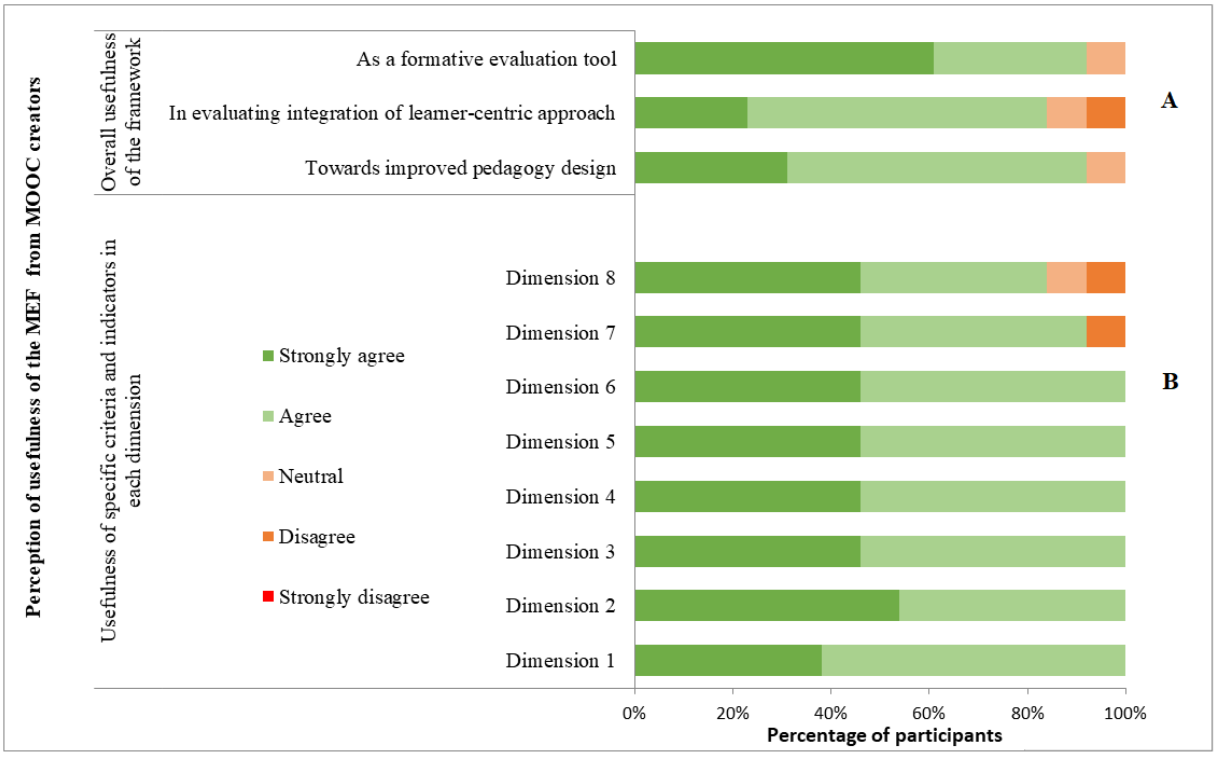
We focused on our first research question through quantitative analysis of usability and usefulness of the MEF for MOOC creators. The average equivalent score for the scale of usability for all participants was 78.46. Hence, based on the mean system SUS scores rating (Bangor et al., 2008), MOOC instructors classified the MEF as "good" in terms of its usability. There was a high level of agreement observed in the perception of usefulness for each dimension, ranging from 84% to 100% (average 97%). MOOC creators also showed a strong positive perception of the use of the MEF in: (a) evaluating integration of learner-centric approaches in MOOCs (84%); (b) employing the framework as a formative evaluation tool (92%); and (c) bringing a positive change in pedagogy design of MOOCs (92%). These results, shown in Figure 4, were based on the experience of participants with the framework while evaluating their own MOOCs.

Additionally, open-ended questions on MEF components that were missing or difficult to comprehend provided insightful feedback. The responses from the participants were analysed and categorised into two

groups: (a) as useful suggestions which further helped in improving clarity and resulted in Version 1.2 of the MEF, and (b) as identified limitations of the framework which have been acknowledged in the discussion section.

Figure 4

Perception Results on the A) Overall Usefulness of the MEF and B) Usefulness of its Individual Dimensions

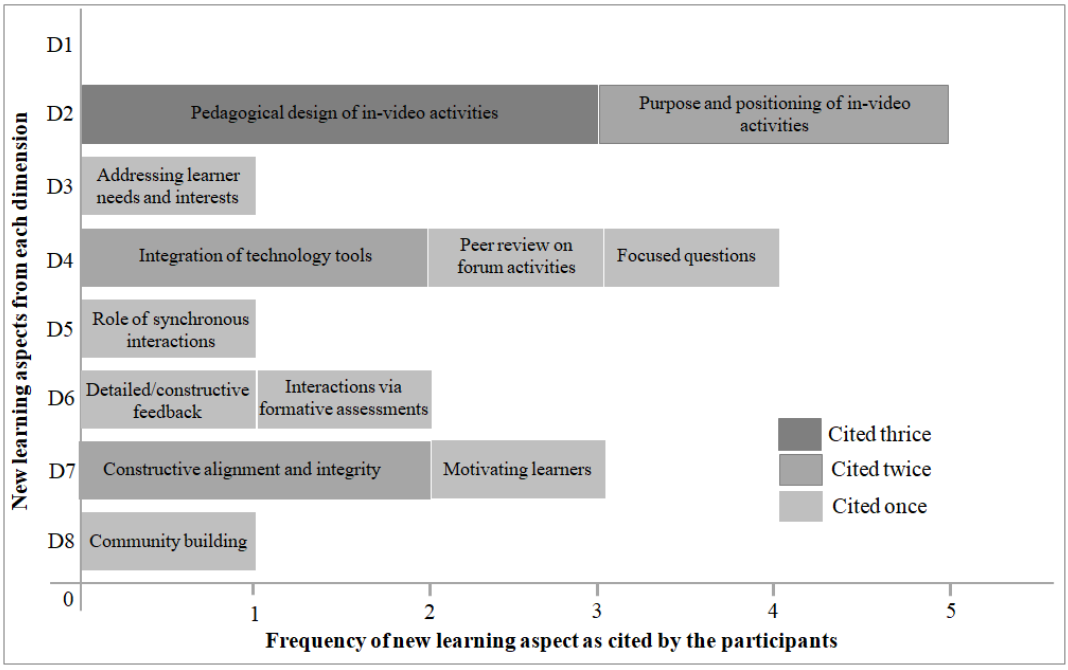


Participants' Experience in Terms of New Learning and the Potential Use of the MEF

To answer our second research question, the participants were asked to provide (a) examples of new learning from the MEF and (b) their perception on making this framework available to MOOC creators for formative evaluation. One interesting point to note was that different participants (n = 12) acknowledged different aspects from varied dimensions as new learning. The content analysis of these responses showed that new learning branched from all dimensions, except dimension 1, which may seem fundamental to many (Figure 5). Some of the learning aspects were emphasised multiple times by different learners. The learning aspect which was cited most often was the pedagogical design of the video content and associated in-video activities.

Figure 5

Visual Distribution of New Learning Aspects, as Identified by the Study Participants, From Different Dimensions of the MEF



Participants (n = 12) expressed their rationale to provide the MEF to MOOC creators for formative evaluation of their courses. Inductive thematic analysis led to the generation of two themes of perception for potential use of the MEF in the field. These included the use of the MEF (a) as a comprehensive guide for MOOC creators, and (b) in bringing reflections and improving the MOOC experience (Table 3). The framework was recognised as a comprehensive guide, which was perceived to provide effective pedagogical direction towards planning, creation, and evaluation of MOOCs. Additionally, the learners also perceived the framework as bringing reflections on various aspects of course design and learner connection, thus improving the MOOC experience for both instructors and students.

Table 3

Illustrative Examples for the Two Themes Identified From Learners' Perceptions on the Potential Use of the MEF in the Field

Themes	Excerpts from learners' perceptions
Comprehensive guide for MOOC creators	"The framework will give an idea of what a course instructor needs to consider when preparing for a MOOC. I would say even when the instructor has begun the preparation, he/she can revisit the framework to keep a careful check on the different criteria."

	"Yes. It is a comprehensive list, and it will help me at all stages of MOOCs development like planning, production, post production, delivering, and managing the course."
Bringing reflections and improving MOOC experience	"I looked at my course design in retrospect and realised inadequacies of some components that would have made the MOOC better."
	"It will help improve the experience of both instructors and students if used before offering the course."

Participants' Reflections on Their MOOC Scores Obtained Using the MEF

Employing the MEF, participants obtained dimension-based scores for their respective courses. To answer our third research question, participants were asked a focused question: "Can you provide one example from your MOOC scores to reflect on your experience with the MEF in evaluating integration of a learner-centric approach?" Participants (n = 12) provided examples, expressing ways in which they could reflect on the differences in scores obtained for different dimensions and how that related to their corresponding design efforts (Table 4).

Table 4

Illustrative Examples of Reflections From MOOC Creators on Their Scores Obtained From the MEF and its Correlation to Their Corresponding Design Efforts

Evaluated MOOC discipline	Excerpts from learners' reflections
Computer science	"We spent a lot of time thinking about the videos, and how to structure content. So we scored well in dimension 2. Towards the end, we did not have the bandwidth to think deeply about discussion forums, learner connection, and formative assessments. These dimensions received a lower score in MEF."
Learning analytics	"For videos, we used the learner-centric MOOC model to develop the content, so we got better scores in dimension 2. However, we didn't focus on dimension 8, i.e., learner connection practices during our course offering which got a

	low score."
Instructional design	"In my MOOC, 'video content' dimension scored highest (3) and learner connection practices scored 2.1. This was because most indicators under video content dimension were adequately addressed in my MOOC, but with respect to learner connection dimension, indicators related to community building were either missing or inadequately addressed."

As observed in Table 4, MOOC creators agreed that the scores obtained for their MOOCs using the MEF aligned with the efforts with respect to their pedagogy design. The dimensions that included more learner-centric interventions in their MOOC scored higher as compared to the dimensions which were not learner-centric or less learner-centric. This implied the effectiveness of the framework in evaluating the integration of learner-centric pedagogy in MOOCs.

Discussion

Systematic evaluation of pedagogical practices is one way of bringing a positive change to MOOC design (Jansen et al., 2017). There are some existing quality evaluation approaches which provide a useful overview and guide for e-learning design (Ossiannilsson et al., 2015; Rosewell & Jansen, 2014; Shattuck, 2015). The proposed evaluation framework described in this study enriches the existing methods to assess the incorporation of learner-centric pedagogy in MOOCs.

The MEF focuses on formative evaluation of the pedagogical quality of all critical input elements (Jansen et al., 2017) of an xMOOC. The detailed indicators in the framework surpass the superficial evaluation of prescribed criteria and enable identification of weaknesses and strengths in different dimensions of MOOCs. Hence, the MEF not only focuses on quality evaluation but also provides reflective indicators for quality enhancement. Recent literature (Aloizou et al., 2019) has called for the design of such evaluation methods which can facilitate higher pedagogical quality in MOOCs.

We examined the usability and usefulness of the MEF from the perspective of MOOC creators in the field. Quantitative results showed a good usability of the MEF for MOOC creators (N = 13) with an average SUS score of 78.46. The quantitative analysis also showed a high level of agreement in the perception of usefulness for all dimensions of the MEF, and the use of the framework (a) in evaluating integration of learner-centric approaches in MOOCs, (b) as a formative evaluation tool, and (c) in bringing a positive change in pedagogy design of MOOCs.

Participants expressed their learning from the framework and its potential use in the field for formative evaluation of MOOCs. A notable observation was that the participants acknowledged new learning from varied dimensions of the framework. This implies the potential usefulness of each dimension, considering

the scale and versatility of MOOC creators. New learning on pedagogical design of the video content and associated in-video activities were most often emphasised by participants. This is not surprising considering the role of video content in MOOCs and existing literature on challenges of low learner engagement in MOOC videos (Geri et al., 2017).

The participants expressed a positive perception towards the potential use of the framework as a comprehensive guide in bringing reflections and improving the experience of instructors and students. The promising uses of the MEF which emerged in this analysis align with literature recommendations for new frameworks with quality indicators to clearly assess specific elements of the active learning pedagogies with an emphasis on reflection (Aloizou et al., 2019; Jansen et al., 2017). Regarding the scores obtained using the MEF, the participants agreed that their respective scores correctly reflected the efforts taken to integrate learner-centric strategies in the evaluated dimensions. This indicated the effectiveness of the MEF in evaluating learner-centric pedagogy design of MOOCs in varied disciplines.

In the process of examining learner-centric pedagogy, the MEF attempts to assess the opportunities provided for learner engagement in the context of MOOCs (Deng et al., 2020). Emotional engagement opportunities are assessed by evaluating the presence of learner interactions in videos and constructive feedback mechanisms. Cognitive engagement opportunities are assessed by evaluating the design of learning resources and assessment activities at varied cognitive levels. Social engagement opportunities are examined by evaluating the presence of collaborative activities and interactions between peers.

In terms of limitations, the framework does not particularly focus on specially-abled learners in its design. However, some efforts have been made toward including diverse learner needs in dimension 3 and dimension 8. Secondly, the large-scale MOOC enrolment may interfere with straightforward evaluation of a few indicators related to collaboration-based activities. Thirdly, two MOOC creators pointed out that evaluating all dimensions at once, using the MEF toolkit, involves a time-consuming process. Though it may take a little longer for reflection during the first encounter with the MEF, it is a comprehensive tool which can be used for structured and straightforward formative evaluation of all future MOOC offerings.

In terms of generalizability, the adoption of the MEF is not only restricted to MOOCs but may also be used for pedagogy evaluation of other online or blended courses following a similar course structure. However, as a limitation, the current study was restricted to a small sample size in the local context and did not evaluate the use of the MEF with a large and diverse population of MOOC creators or MOOC providers. To address the same, subsequent to this primary implementation of the MEF towards its validation, the framework will be re-examined by diverse users during its large-scale field implementation in order to establish its generalizability. In view of a recent field study (Kizilcec et al., 2020) which emphasised on the context-based effects of interventions in MOOCs, it will be intriguing to examine the influence of the MEF in different contexts. The impact of the MEF on the effectiveness of MOOCs and its learning experience will also be investigated in future studies.

Conclusion

This study demonstrates the MOOC Evaluation Framework which evaluates the integration of learner-centric pedagogy in MOOC design. The framework provides an opportunity to MOOC creators for formative evaluation of their pedagogy to promote active learner participation and enhance engagement of learners with content, course team, and peers. Thirteen MOOC creators from eight different educational institutes evaluated their courses, in six different disciplines, using the MEF. The framework was found to be useful as a formative evaluation tool for evaluating integration of learner-centric approaches and bringing a positive change in pedagogy design of MOOCs. Benefits of the framework, expressed by MOOC creators, aligned with literature recommendations for new MOOC pedagogy evaluation measures, that is, to assess specific elements of active learning pedagogy; detect weaknesses in course elements; and acquire important learning for designing or redesigning a MOOC. The MEF seems to be a critical step forward for MOOC creators and MOOC providers to ensure learner-centric approach in pedagogy design with bigger goals to facilitate active learner participation, enhance learner engagement, and lower the attrition rates in MOOCs.

Acknowledgement

We would like to thank Next Education Research Lab for their financial support in the project. We are thankful to Mr. Danish Shaikh for the design of the web-based application of the MEF. We would also like to thank Prof. Sameer Sahasrabudhe and Dr. Jayakrishnan Warriem for their support as experts in the internal validation study. We would like to express our gratitude to all faculty and research scholar participants from different institutes who participated in the external validation study. Special thanks to Dr. Jayakrishnan Warriem for helping us approach many of these participants. We would also like to thank Mr. Jatin Ambasana for insightful discussions on the literature related to existing MOOC evaluation approaches. We are also thankful to Prof. Ramkumar Rajendran, Mr. David John, and Mr. Herold PC for their advice on various aspects of the web-based design of the MEF toolkit.

References

Aloizou, V., Villagrá Sobrino, S. L., Martínez Monés, A., Asensio-Pérez, J. I., & García-Sastre, S. (2019) Quality assurance methods assessing instructional design in MOOCs that implement active learning pedagogies: An evaluative case study. In M. Calise, C. Delgado Kloos, C. Mongenet, J. Reich, J. A. Ruipérez-Valiente, G. Shimshon, T. Staubitz, & M. Wirsing (Eds.), *EMOOCs 2019 work in progress papers of research, experience and business tracks* (pp. 14–19). Sun SITE CEUR. http://ceur-ws.org/Vol-2356/research_short3.pdf

Alturkistani, A., Lam, C., Foley, K., Stenfors, T., Blum, E. R., Van Velthoven, M. H., & Meinert, E. (2020). Massive open online course evaluation methods: Systematic review. *Journal of Medical Internet Research*, *22*(4), Article e13851. https://doi.org/10.2196/13851

Bangor, A., Kortum, P. T., & Miller, J. T. (2008). An empirical evaluation of the system usability scale. *International Journal of Human-Computer Interaction*, *24*(6), 574–594. https://doi.org/10.1080/10447310802205776

Biggs, J. (1999). What the student does: Teaching for enhanced learning. *Higher Education Research & Development*, *18*(1), 57–75. https://doi.org/10.1080/0729436990180105

Bransford, J. D., Brown, A. L., & Cocking, R. R. (Eds.). (2000). *How people learn: Brain, mind, experience, and school*. National Academy Press. http://www.csun.edu/~SB4310/How%20People%20Learn.pdf

Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology*, *3*(2), 77–101. https://doi.org/10.1191/1478088706qp063oa

Brooke, J. (1996). SUS: A "quick and dirty" usability scale. In P. W. Jordan, B. Thomas, I. L. McClelland, & B. Weerdmeester (Eds.), *Usability evaluation in industry* (chapter 21). Taylor & Francis. https://www.taylorfrancis.com/chapters/edit/10.1201/9781498710411-35/sus-quick-dirty-usability-scale-john-brooke

Burd, E. L., Smith, S. P., & Reisman, S. (2015). Exploring business models for MOOCs in higher education. *Innovative Higher Education*, *40*(1), 37–49. https://doi.org/10.1007/s10755-014-9297-0

Chickering, A. W., & Gamson, Z. F. (1987, March). Seven principles for good practice in undergraduate education. *AAHE Bulletin*, 3–7. https://eric.ed.gov/?id=ed282491

Chukwuemeka, E. J., Yoila, A. O., & Iscioglu, E. (2015). Instructional design quality: An evaluation of Open Education Europa Networks' open courses using the first principles of instruction. *International Journal of Science and Research*, *4*(11), 878–884. https://www.ijsr.net/get_abstract.php?paper_id=NOV151323

Clark, R. C., & Mayer, R. E. (Eds.). (2016). *E-learning and the science of instruction: Proven guidelines for consumers and designers of multimedia learning*. John Wiley & Sons. https://doi.org/10.1002/9781119239086

Conole, G. G. (2013). MOOCs as disruptive technologies: Strategies for enhancing the learner experience and quality of MOOCs. *Revista de Educación a Distancia (RED)*, *39*. https://revistas.um.es/red/article/view/234221

Creelman, A., Ehlers, U., & Ossiannilsson, E. (2014). Perspectives on MOOC quality: An account of the EFQUEL MOOC Quality Project. *INNOQUAL-International Journal for Innovation and Quality in Learning*, *2*(3), 78–87. https://www.lunduniversity.lu.se/lup/publication/225285a4-84b4-49d4-9f64-59ec16b15a83

Deng, R., Benckendorff, P., & Gannaway, D. (2020). Learner engagement in MOOCs: Scale development and validation. *British Journal of Educational Technology*, *51*(1), 245–262. https://doi.org/10.1111/bjet.12810

Egloffstein, M., & Ifenthaler, D. (2017). Employee perspectives on MOOCs for workplace learning. *TechTrends*, *61*(1), 65–70. https://doi.org/10.1007/s11528-016-0127-3

Fidalgo-Blanco, Á., Sein-Echaluce, M. L., & García-Peñalvo, F. J. (2015). Methodological approach and technological framework to break the current limitations of the MOOC model. *Journal of Universal Computer Science*, *21*(5), 712–734. https://repositorio.grial.eu/bitstream/grial/426/1/jucs_21_05_0712_0734_blanco.pdf

Geri, N., Winer, A., & Zaks, B. (2017). Challenging the six-minute myth of online video lectures: Can interactivity expand the attention span of learners? *Online Journal of Applied Knowledge Management (OJAKM)*, *5*(1), 101–111. https://doi.org/10.36965/OJAKM.2017.5(1)101-111

Hew, K. F. (2018). Unpacking the strategies of ten highly rated MOOCs: Implications for engaging students in large online courses. *Teachers College Record, 120*(1), 1–40. https://doi.org/10.1177/016146811812000107

Jansen, D., Rosewell, J., & Kear, K. (2017). Quality frameworks for MOOCs. In M. Jemni, Kinshuk, & M. Khribi (Eds.), *Open education: From OERs to MOOCs* (pp. 261–281). Springer. https://doi.org/10.1007/978-3-662-52925-6_14

Kizilcec, R. F., Reich, J., Yeomans, M., Dann, C., Brunskill, E., Lopez, G., Turkay, S., Williams, J. J., & Tingley, D. (2020). Scaling up behavioral science interventions in online education. *Proceedings of the National Academy of Sciences*, *117*(26), 14900–14905. https://doi.org/10.1073/pnas.1921417117

Konrad, A. (2017, December 20). Coursera fights to keep the promise of MOOCs alive with corporate customer push. *Forbes*. https://www.forbes.com/sites/alexkonrad/2017/12/20/coursera-goes-corporate-to-keep-alive-promise-of-moocs/?sh=1c5e03b2543c

Lee, G., Keum, S., Kim, M., Choi, Y., & Rha, I. (2016). A study on the development of a MOOC design model. *Educational Technology International*, *17*(1), 1–37. https://koreascience.kr/article/JAKO201612359835226.pdf

Lowenthal, P. R., & Hodges, C. B. (2015). In search of quality: Using quality matters to analyze the quality of massive, open, online courses (MOOCs). *The International Review of Research in Open and Distributed Learning*, *16*(5), 83–101. https://doi.org/10.19173/irrodl.v16i5.2348

Margaryan, A., Bianco, M., & Littlejohn, A. (2015). Instructional quality of massive open online courses (MOOCs). *Computers & Education*, *80*, 77–83. https://doi.org/10.1016/j.compedu.2014.08.005

Mayer, R. E. (2019). Thirty years of research on online learning. *Applied Cognitive Psychology*, *33*(2), 152–159. https://doi.org/10.1002/acp.3482

Merrill, M. D. (2002). First principles of instruction. *Educational Technology Research and Development*, *50*(3), 43–59. https://doi.org/10.1007/BF02505024

Oh, E. G., Chang, Y., & Park, S. W. (2020). Design review of MOOCs: Application of e-learning design principles. *Journal of Computing in Higher Education*, *32*(3), 455–475. https://doi.org/10.1007/s12528-019-09243-w

Ossiannilsson, E., Williams, K., Camilleri, A. F., & Brown, M. (2015). *Quality models in online and open education around the globe. State of the art and recommendations*. International Council for Open and Distance Education. https://doi.org/10.25656/01:10879

Paas, F., & Sweller, J. (2014). Implications of cognitive load theory for multimedia learning. In R. E. Mayer (Ed.), The Cambridge handbook of multimedia learning (2nd ed.) (pp. 27–42). New York: Cambridge University Press. https://doi.org/10.1017/CBO9781139547369.004

Pilli, O., & Admiraal, W. F. (2017). Students' learning outcomes in Massive Open Online Courses (MOOCs): Some suggestions for course design. *Journal of Higher Education*, *7*(1), 46–71. https://scholarlypublications.universiteitleiden.nl/access/item%3A2903812/view

Read, T., & Rodrigo, C. (2014). Towards a quality model for UNED MOOCs. *Proceedings of the European MOOC Stakeholder Summit*, 282-287. https://www.oerknowledgecloud.org/record686

Richey, R. C. (2006). Validating instructional design and development models. In J. M. Spector, C. Ohrazda, A. Van Schaack, & D. A. Wiley (Eds.), *Innovations in instructional technology* (pp. 171–185). Routledge. https://doi.org/10.4324/9781410613684

Rosewell, J., & Jansen, D. (2014). The OpenupEd quality label: Benchmarks for MOOCs. *INNOQUAL: The International Journal for Innovation and Quality in Learning*, *2*(3), 88–100. http://oro.open.ac.uk/41173/

Rubio, D. M., Berg-Weger, M., Tebb, S. S., Lee, E. S., & Rauch, S. (2003). Objectifying content validity: Conducting a content validity study in social work research. *Social Work Research*, *27*(2), 94–104. https://doi.org/10.1093/swr/27.2.94

Shah, V., Murthy, S., Warriem, J., Sahasrabudhe, S., Banerjee, G., & Iyer, S. (2022). Learner-centric MOOC model: A pedagogical design model towards active learner participation and higher completion rates. *Educational Technology Research and Development*, *70*(1), 263-288. https://link.springer.com/article/10.1007/s11423-022-10081-4

Scriven, M. (1967). The methodology of evaluation. In R. W. Tyler, R. M. Gagne, & M. Scriven (Eds.), *Perspectives of curriculum evaluation* (pp. 39–83). Rand McNally. https://www.scirp.org/(S(czeh2tfqw2orz553k1w0r45))/reference/referencespapers.aspx?referenceid=3081112

Shattuck, K. (2015). Research inputs and outputs of Quality Matters: Update to 2012 and 2014 versions of *What We're Learning from QM-Focused Research*. Quality Matters. https://ascnet.osu.edu/storage/meeting_documents/1384/FINAL-9_18_15%20update-QM%20Research.pdf

Sim, J., & Wright, C. C. (2005). The kappa statistic in reliability studies: Use, interpretation, and sample size requirements. *Physical Therapy,* 85(3), 257–268. https://doi.org/10.1093/ptj/85.3.257

Stracke, C. M., & Trisolini, G. (2021). A systematic literature review on the quality of MOOCs. *Sustainability*, *13*(11), Article 5817. https://doi.org/10.3390/su13115817

Stracke, C. M. (2019). Quality frameworks and learning design for open education. *The International Review of Research in Open and Distributed Learning*, *20*(2). https://doi.org/10.19173/irrodl.v20i2.4213

Stracke, C. M., Tan, E., Texeira, A. M., do Carmo Pinto, M., Vassiliadis, B., Kameas, A., Sgouropoulou, C., & Vidal, G. (2018). *Quality reference framework (QRF) for the quality of massive open online courses (MOOCs): Developed by MOOQ in close collaboration with all interested parties worldwide*. MOOQ. https://research.ou.nl/en/publications/quality-reference-framework-qrf-for-the-quality-of-massive-open-o

Sweller, J., Ayres, P., Kalyuga, S. (2011). Measuring cognitive load. Cognitive load theory, 71-85. https://link.springer.com/chapter/10.1007/978-1-4419-8126-4_6

Tessmer, M. (1993). *Planning and conducting formative evaluations*. Routledge. https://doi.org/10.4324/9780203061978

Toven-Lindsey, B., Rhoads, R. A., & Lozano, J. B. (2015). Virtually unlimited classrooms: Pedagogical practices in massive open online courses. *The Internet and Higher Education*, *24*, 1–12. https://doi.org/10.1016/j.iheduc.2014.07.001

Watson, W. R., Watson, S. L., & Janakiraman, S. (2017). Instructional quality of massive open online courses: A review of attitudinal change MOOCs. *International Journal of Learning Technology*, *12*(3), 219–240. https://doi.org/10.1504/IJLT.2017.088406

Vygotsky, L. S. (1978). *Mind in society: Development of higher psychological processes* (M. Cole, V. John-Steiner, S. Scribner, & E. Souberman, Eds.). Harvard University Press. https://www.hup.harvard.edu/catalog.php?isbn=9780674576292

Yilmaz, A. B., Ünal, M., & Çakir, H. (2017). Evaluating MOOCs according to instructional design principles. *Journal of Learning and Teaching in Digital Age*, *2*(2), 26–35. https://dergipark.org.tr/en/pub/joltida/issue/55467/760086

Yousef, A. M. F., Chatti, M. A., Schroeder, U., & Wosnitza, M. (2014, July). What drives a successful MOOC? An empirical examination of criteria to assure design quality of MOOCs. In *2014 IEEE 14th International Conference on Advanced Learning Technologies* (pp. 44–48). IEEE. https://doi.org/10.1109/ICALT.2014.23

International **R**eview of **R**esearch in **O**pen and **D**istributed **L**earning
Volume 24, Number 2

May – 2023

How Instructors' TPACK Developed During Emergency Remote Teaching: Evidence From Instructors in Faculties of Education

Ünal Çakıroğlu[1], Merve Aydın[2], Yılmaz Bahadır Kurtoğlu[3], and Ümit Cebeci[4]
[1,2]Trabzon University, Turkey; [3]Recep Tayyip Erdoğan University, Turkey; [4]Karabük University, Turkey

Abstract

Higher education instructors tried to find best teaching ways during the pandemic. Instructors who were faced with emergency situations used various technologies to deliver their courses. In this study, an online survey was used to ask instructors about their experiences regarding their development of technological pedagogical content knowledge (TPACK) during emergency remote teaching (ERT); 231 responses were received from instructors from faculties of education. The survey was a five-point Likert-type scale include the dimensions of pedagogical knowledge, pedagogical knowledge, technological knowledge, technological content knowledge, pedagogical content knowledge, technological pedagogical knowledge, and technological pedagogical content knowledge. Instructors rated their own non-technological knowledge (pedagogical knowledge, content knowledge, and pedagogical content knowledge) relatively higher than their knowledge including technology (technological knowledge, technological pedagogical knowledge, and technological content knowledge). The findings indicate that instructors had a consistently high level of perceived knowledge in all TPACK dimensions. Regarding developments in instructors' TPACK, several suggestions were made, including novel technologies and pedagogies specialized for ERT.

Keywords: emergency remote teaching, ERT, technological pedagogical content knowledge, TPACK, instructors, instructor's component

Introduction

The widespread closing of schools due to the COVID-19 outbreak shocked the educational community. The global pandemic dramatically affected higher education institutions worldwide as campuses around the globe were forced to close their doors. Instructors had to remain at home from the spring of 2020 onward, and a temporary shift from in-person instructional delivery to an alternate delivery mode was required.

Instruction during emergency remote teaching required provision of solutions to the urgent need for online teaching via online teaching tools (Barbour et al., 2020). This situation forced instructors at higher education institutions to find the best way to effectively plan their instruction, deliver courses, and assess students' learning and their teaching (Hodges et al., 2020). This shift of instructional delivery method due to crisis circumstances has involved the use of fully remote teaching solutions for instruction or education (emergency remote teaching [ERT]). Instructors also needed to cope with organizational issues. Many adapted their courses to be delivered via a learning management system (LMS). However, some instructors came across technological and pedagogical challenges during this period (Ferri et al., 2020). Some were caught unprepared for this new form of teaching and learning (Tanak, 2019). Instructors need specific skills to implement pedagogical strategies; they therefore must adopt new technologies and content knowledge to do so.

The challenges of online learning generally originate from instructors' lack of knowledge in regard to technology use as well as their need to learn appropriate pedagogy for technology integration; engage students online via materials such as videos, images, and animations; and assess learning and instruction in an online context (Verawardina et al., 2020). Thomas and Rogers (2020) state that technological challenges result mainly from lack of access to technology, online teaching platforms, and/or the Internet. Instructors' technological knowledge includes efficient use of various digital tools in the online teaching process. In addition to technological knowledge, teachers are also required to master pedagogical and content knowledge to identify, integrate, manage, and evaluate learners' performances during teaching (Valtonen et al., 2017). Social challenges such as peer support and inadequate instructor–student interaction also exist.

In sum, instructors found themselves exposed to these challenging imperative tasks during ERT. The emergency situation required instructors be able to holistically teach, plan, organize, and continue online courses. Thus, during the COVID-19 pandemic, technological pedagogical content knowledge (TPACK) became essential to be exhibited in remote teaching to increase instructors' capacity to teach online. This study attempts to understand this complexity, considering the developments of the integration of three areas of knowledge (pedagogical, technological, and content knowledge) in the context of the TPACK framework (Koehler et al., 2013) during the pandemic.

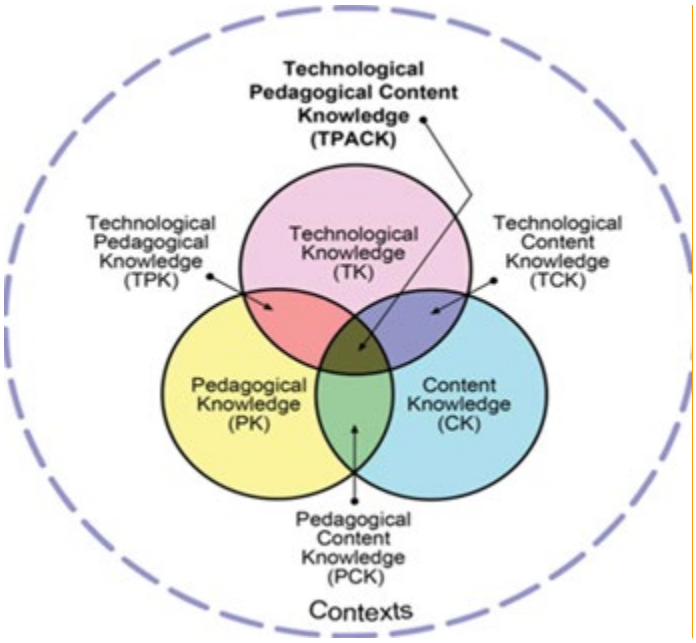
TPACK in Online and Emergency Remote Teaching

TPACK involves an understanding of technology integration in an educational context to help align technology, pedagogy, and content (Giannakos et al., 2015; Harris & Hofer, 2009; Koehler et al., 2013), as well as the complexity of relationships among students, teachers, content, technologies, and practices (Oliver, 2011; Sang et al., 2016; Voogt et al., 2013). Using Shulman's (1986) pedagogical content knowledge framework and combining the relationships between content knowledge (subject matter),

technological knowledge (computers, the Internet, digital video, etc.), and pedagogical knowledge (practices, processes, strategies, procedures, and methods of teaching and learning), Koehler and Mishra (2009) define TPACK as the connections and interactions between these three types of knowledge (Figure 1).

Figure 1

Technological Pedagogical Content Knowledge (TPACK) Model



Note. From "What is technological pedagogical content knowledge (TPACK)?" by M. Koehler and P. Mishra, 2009, *Contemporary Issues in Technology and Teacher Education*, *9*(1), p. 63 (https://www.learntechlib.org/primary/p/29544/). Copyright 2009 by Society for Information Technology & Teacher Education.

In the model, technological pedagogical knowledge (TPK) includes the teacher's knowledge of technologies and their uses in teaching within appropriate pedagogy (Koehler & Mishra, 2009). Technological content knowledge (TCK) involves understanding affordances of technologies within a subject matter to be taught (Mishra & Koehler, 2009). Pedagogical content knowledge (PCK) refers to knowledge of the content to be taught and the pedagogy, including effective teaching strategies to guide instructors (Koehler & Mishra, 2009).

Previous TPACK studies involve investigations of teachers' TPACK by means of observing lesson plans (Canbazoglu Bilici et al., 2016), tasks, and TPACK surveys (Cheng, 2017; Ciptaningrum, 2017; Getenet et al., 2016; Giannakos et al., 2015). Different versions of the TPACK model have been applied to understanding both pre-service and in-service teachers' knowledge of and skills in integrating technology into teaching, which is also used in ERT (Lamminpää, 2021).

During the pandemic, instructors have needed to cope with unforeseen problems to meet students' needs. One of the biggest disruptions faced by instructors was transforming their traditional in-person teaching into remote teaching. However, they started this transformation by devising their own ways of technology integration to deliver their instruction as a result of the emergency (Arcueno et al., 2021).

Lack of teachers' TPACK and skills leads to ineffective student learning. It is essential to provide instructors to notice and appreciate their strengths as educators in such cases (Can & Silman-Karanfil, 2022). Accordingly, TPACK may be an important element of teacher's knowledge, which is of great significance to the cultivation of teachers' professional development in ERT.

Need for Study

The COVID-19 outbreak required new demands of instructors in terms of using intensive technology (Ferri et al., 2020) and their ability to use such technology in remote teaching (Ahtiainen et al., 2022). Before the pandemic, no clear directions existed to guide educators in this regard. Thus, direction for sustainable education in these unprecedented times is needed. Understanding instructors' experiences may provide valuable insights into how individuals responded, and it can inform future course design, institutional responses, and support structures for instructors, students, and organizers.

In addition, this study, by identifying instructors' TPACK, raises awareness of the urgency of TPACK in ERT. In this context, there are studies regarding TPACK in face-to-face teaching (Tyarakanita, 2020) and limited studies of TPACK in online teaching suggesting that TPACK was beneficial to instructors' professional development and efficient for assessing instructors' skills (Archambault & Crippen, 2009; Haviz et al., 2020; Juanda et al., 2021). However, there is still a need to fill in the gaps resulting from the lack of TPACK assessment in ERT studies. Thus, this study is focused on addressing instructors' experiences during ERT to understand their integration process and the conditions of technology and pedagogy.

Research Problem

The purpose of this study is to investigate how ERT due to the COVID-19 pandemic affected instructors' development of TPACK within their teaching experiences.

Guided by our main research question, "How does ERT affect instructors' ability to use TPACK?" we also addressed the following questions:

- How can instructors' online teaching processes be explained in terms of TPACK in the ERT process?
- Does instructors' online TPACK differ according to experience and the method of course delivery?

Method

This study examines instructors' TPACK emerging from their exposure to ERT. Qualitative data were gathered with a descriptive survey.

Participants

The study participants were chosen via purposeful sampling. They consisted of 231 instructors from 20 different education faculties of higher education institutions in Turkey. Instructors were between 25 and 60 years of age; 48.5% identified as male and 51.5% female. Participants' demographic data are provided in Table 1.

Table 1

Participant Demographics

Characteristic		*f*	%
Gender	Female	119	51.5
	Male	112	48.5
Age	25–34	42	18.2
	35–44	102	44.2
	45–60	73	31.6
	60+	14	6.1
Years in profession	0–10	61	26.4
	11–20	86	37.2
	21–30	56	24.2
	30+	28	12.1

The participants used various LMSs and virtual classrooms as online teaching platforms during the pandemic period. The reported platforms are presented in Table 2.

Table 2

Online Teaching Platforms Used by Institutions During the COVID-19 Pandemic

Virtual classroom	LMS	LMS and virtual classroom	Other teaching tools
Google Meet	Moodle	Blackboard	Microsoft 365
Microsoft Teams	ALMS	Mergen	Safe Exam
BigBlueButton	ToteltekLMS		Cisco
Perculus	Google Classroom		Screencasts
Zoom	Yeri Uzem Portal		Generic online teaching tools
Adobe Connect	Olive		
	Canvas		

Data Collection Tools

We used the technological pedagogical content knowledge scale developed by Horzum et al. (2014) to determine the TPACK of the instructors. This is a five-point Likert-type scale with the following ratings: 5 = completely agree; 4 = agree; 3 = undecided; 4 = disagree; 1 = strongly disagree. It has a reliability coefficient of 0.98. The participants' TPACK levels were interpreted according to the scores obtained from the dimensions in the scale. The TPACK scale has 7 subdimensions consisting of 51 items total: 8 items about content knowledge (PK), 7 items about pedagogical knowledge (PK), 6 items about technological knowledge (TK), 6 items about technological content knowledge (TCK), 8 items about pedagogical content knowledge (PCK), 8 items about technological pedagogical knowledge (TPK), and

8 items about technological pedagogical content knowledge (TPACK). Responses to the items were interpreted to identify how participants thought the period of ERT had affected their information and communication technology skills. If respondents thought their skills had changed, they could specify whether they thought they had improved or declined. They could also describe their experiences with ERT in their own words.

Data Analysis

The TPACK scale was used to gather data. Cronbach's alpha (α) reliability coefficient of the scale for this study was 0.972. The normality test was applied to the total score of the TPACK scale; our findings indicate that the TPACK scores meet the normality condition. Four intervals were calculated to describe the scores from the scale as follows: 1.00–1.79 = very low; 1.80–2.59 = low; 2.60–3.39 = moderate; 3.40–4.19 = high; and 4.20–5.00 = very high. An independent *t*-test was used to determine whether TPACK scores differed significantly in terms of the gender variable, and one-way analysis of variance (ANOVA) was used to determine whether there was a significant difference in TPACK scores in terms of respondents' occupation, seniority, and age.

Results

In presenting our results from the survey, first, the scores from dimensions of TPACK are described, and then relationships between the scores in the dimensions and variables are addressed. In general, instructors were found to have consistently high levels of perceived knowledge in all TPACK domains.

Technological Knowledge

The participant' perspectives regarding TK (arithmetic mean and frequencies) are shown in Table 3.

Table 3

Technological Knowledge Scores

Item		$\bar{X}$	*SD*
1	I follow new technologies.	4.16	0.840
2	I know how to solve problems related to technology.	3.84	0.884
3	I have sufficient knowledge about using the technologies I need.	3.99	0.808

4	I have the technological knowledge necessary to access information.	4.26	0.728
5	I have the necessary technological knowledge to use the information in the resources I access.	4.19	0.749
6	I have enough knowledge to support students in my class when they have problems with technology use.	3.83	0.930

The value for the scores of all TK items is relatively high, with an average value of 4.04. When the responses about this type of knowledge are examined, the level of TK required to access information got the highest score; the item about finding solutions to students' technological problems was scored lower on average than other items.

Pedagogical Knowledge

Table 4 shows the mean values of instructors' responses to PK items. The items on the subject of course management and use of teaching methods and techniques are above average at 4.58. Item 13, "I can make students evaluate each other," has a noteworthy lower-than-average score of 3.74.

Table 4

Pedagogical Knowledge Scores

Item		$\bar{X}$	*SD*
7	I can adapt my teaching depending on the learning levels of the students.	4.34	0.728

8	I know how to measure student performance.	4.45	0.609
9	I can adapt the teaching process for students with different learning styles.	4.22	0.767
10	I use appropriate teaching strategies, methods, and techniques according to the characteristics of the class.	4.35	0.668
11	In my class, I manage the class as needed.	4.58	0.569
12	I know the necessary methods and techniques to ensure effective participation of students.	4.58	0.599
13	I can make students evaluate each other.	3.74	1.079

Table 4 shows that the PK items have high average scores between 4.00 and 4.50. It is understood that participants' PK level is considerably higher than their TK level, with an average score of 4.32.

Content Knowledge

The descriptive statistics of the instructor's responses on CK are shown in Table 5.

Table 5

Content Knowledge Scores

Item		$\bar{X}$	*SD*
14	I decide on the scope of the topics I will lecture.	4.64	0.565
15	I learn new and changing information about my field.	4.58	0.569
16	I follow the developments in my field.	4.56	0.635
17	I know the current classification of information in my field.	4.48	0.617
18	I know the terms related to my field.	4.64	0.525
19	I know the sources of information regarding my field.	4.61	0.523
20	I know the appropriate resources to direct my students regarding my field.	4.58	0.561
21	I know how to improve myself in my field.	4.64	0.525

All items regarding content knowledge were scored very high: above 4.50. The average of the items about being aware of developments in one's field, knowing sources and concepts, and classifying information was 4.59, which is considerably high compared with all other knowledge domains.

Technological Content Knowledge

The descriptive statistics of each item regarding 231 participants' responses to items about TCK are provided in Table 6.

Table 6

Technological Content Knowledge Scores

Item		$\bar{X}$	*SD*
22	I have the necessary technological knowledge to access, organize, and use resources related to my field.	4.38	0.680
23	I can use available content related to my field.	4.09	0.842
24	I follow the updates and changes about programs related to my field by using the Internet.	4.43	0.668
25	I enable my students to use technologies related to my field.	4.15	0.757
26	I can benefit from social networks where experts in my field come together to develop professionally.	4.11	0.902

27	I have the necessary technological knowledge and skills to improve my knowledge in my field.	4.24	0.752

The average score for the TCK dimension is high at 4.23. Item 24, "I follow the updates and changes about programs related to my field by using the Internet," scored the highest at 4.43. The item regarding using computer software related to one's field has a relatively lower average score (4.09) compared with the other items.

Pedagogical Content Knowledge

PCK scores are shown in Table 7.

Table 7

Pedagogical Content Knowledge Scores

Item		$\bar{X}$	*SD*
28	I can easily prepare lesson plans for the lesson I will teach.	4.58	0.568
29	I can choose the most appropriate teaching strategy to teach a particular concept.	4.53	0.588
30	I can distinguish the correctness of attempts of my students in problem-solving.	4.45	0.601
31	I know the misconceptions that students may have about a particular subject and I teach accordingly.	4.39	0.657

32	I can choose the appropriate teaching approach necessary to lead my students to think and learn.	4.55	0.564
33	I can use teaching strategies appropriate to the topics I teach.	4.50	0.611
34	I know the subjects that students find difficult to learn in my field	4.54	0.609
35	I can appropriately order the concepts that I will explain.	4.60	0.541

The average score for PCK items is 4.51. Survey item 35, "I can appropriately order the concepts that I will explain," has the highest score (4.60). Items 28 and 32, which point to topics such as shaping the lesson plans and appropriately choosing teaching approaches related to the course, also have higher average scores. Item 31, "I know the misconceptions that students may have about a particular subject and I teach accordingly," has the lowest average score among the PCK items (4.39).

Technological Pedagogical Knowledge

The average score is high ($\bar{X}$ = 4.17) in the items related to TPK. The mean and standard deviation scores for each item are given in Table 8.

Table 8

Technological Pedagogical Knowledge Scores

Item		$\bar{X}$	*SD*
36	I can use technologies that will enable students to acquire new knowledge and skills.	4.22	0.714

37	I have the knowledge and skills to select and use technologies appropriate for students' development in order to enable them to learn effectively.	4.16	0.763
38	I know how the technologies and teaching approaches that I will use affect each other.	4.13	0.761
39	I can choose technologies that can enable my students to learn better.	4.15	0.727
40	I can use technology to create richer learning environments.	4.26	0.707
41	I have enough knowledge to discuss how I can use technology in my lessons.	4.05	0.873
42	I use technology to improve my teaching performance when necessary.	4.26	0.693
43	I can adapt new technologies while using different	4.20	0.725

	methods in my teaching.		

The average scores of all items in the TPK dimension are similar. Items 40 and 42, which focus on rich learning environments and using technology, both have an above-average score of 4.26. However, item 38, which expresses how these technologies and environments will affect each other, has the lowest average score (4.13).

Technological Pedagogical Content Knowledge

The average score in the TPACK dimension was 4.13. The mean scores for each item are shown in Table 9.

Table 9

Technological Pedagogical Content Knowledge Scores

Items		$\bar{X}$	*SD*
44	I can use technology to determine students' level of skill and understanding about a particular subject.	4.15	0.760
45	I can choose and use the strategy, method, and technology appropriate for the course content.	4.33	0.689
46	I can lead my colleagues in the selection and use of appropriate methods and technologies.	3.66	1.033
47	I can develop teaching materials suitable for the subject area, teaching method, and technology.	4.03	0.844

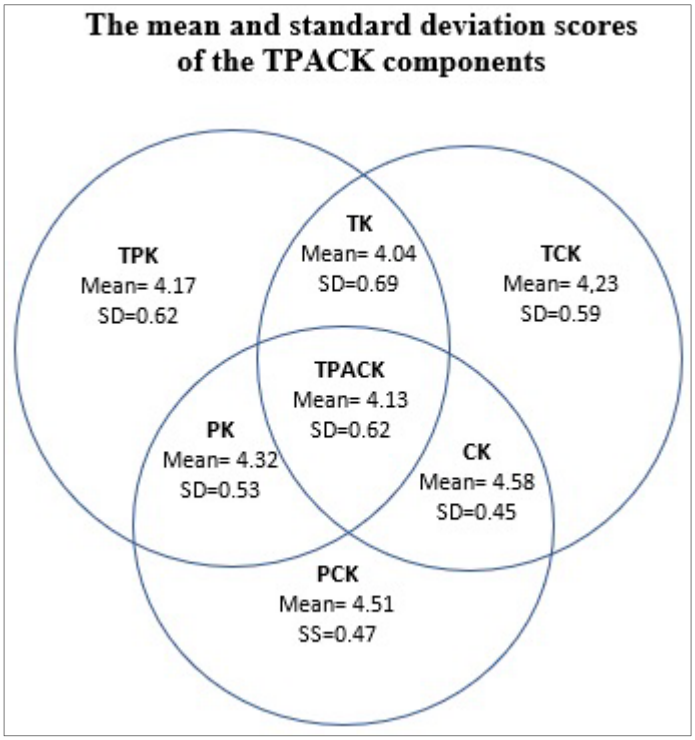
48	I can use technologies that will provide a better understanding of the subject while teaching.	4.25	0.688
49	I can use methods and technologies that will enable students to learn more effectively according to the subject I teach.	4.26	0.685
50	I enable students to use technologies suitable for the teaching method to learn the subject better.	4.13	0.707
51	I can choose teaching methods and technologies that will enable students to study the subject more willingly.	4.29	0.653

Item 46, "I can lead my colleagues in the selection and use of appropriate methods and technologies," has a below-average score of 3.66. On the other hand, item 45, "I can choose and use the strategy, method, and technology appropriate to the course content," which is about teaching approaches and course management, has the highest average score in the TPACK dimension (4.33).

Figure 2 illustrates the mean and standard deviation scores of the TPACK components regarding technology, pedagogy, and content both solely and combined.

Figure 2

Mean Scores in All Dimensions of the Technological Pedagogical Content Knowledge Survey



Note. TPK = technological pedagogical knowledge; TK = technical knowledge; TCK = technological content knowledge; TPACK = technological pedagogical content knowledge; PK = pedagogical knowledge; CK = content knowledge; PCK = pedagogical content knowledge

PCK received the highest average score (4.51), and TK had the lowest (4.04). It is remarkable that the mean scores of the instructors' TK are lower than their scores in other dimensions. Surprisingly, a non-technological knowledge domain, PCK, has one of the highest average scores.

Relationships Among TPACK Domains

Pearson's correlation coefficient was used to examine the relationship between each component of TPACK, which has previously been tested for reliability and normality. The results of the analysis are shown in Table 10.

Table 10

Relationships Between Average Scores of TPACK Components

Variable	TK	PK	CK	TCK	PCK	TPK	TPACK
TK	–	0.448**	0.314**	0.728**	0.311**	0.779**	0.740**
PK		–	0.656**	0.565**	0.750**	0.540**	0.579**
CK			–	0.574**	0.753**	0.464**	0.462**
TCK				–	0.469**	0.800**	0.724**
PCK					–	0.507**	0.527**
TPK						–	0.875**
TPACK							–

Note. n = 231. Pearson's correlation coefficient was used. TPACK = technological pedagogical content knowledge; TK = technological knowledge; PK = pedagogical knowledge; CK = content knowledge; TCK = technological content knowledge; PCK = pedagogical content knowledge; TPK = technological pedagogical knowledge.

** p < .001.

Table 10 demonstrates that a moderately positive relationship was found between all domains. When the scores in each domain were analysed separately, the highest correlation was found between TPK and TPACK (r = 0.875, p < 0.001), and the lowest correlation was found between PCK and TK (r = 0.311, p < 0.001).

TPACK Developments in Terms of Different Variables

The independent groups t-test was used to determine whether the TPACK levels of the instructors differed according to gender (Table 11).

Table 11

TPACK Scores in Terms of Gender

Gender	*n*	$\bar{X}$	*SD*	*p*
Female	119	4.35	0.4347	0.56
Male	112	4.23	0.4847	0.56

Note. TPACK = technological pedagogical content knowledge.

The test result showed that the difference among TPACK scores in terms of gender was not statistically significant ($p > 0.05$). However, after analysing each TPACK subdimension, we found that PK, content knowledge, and PCK values ($p > 0.05$) were statistically significant, and technology knowledge in terms of gender was not statistically significant. In addition, ANOVA was applied to determine whether TPACK scores differed significantly according to seniority and age (Table 12).

Table 12

TPACK Scores in Terms of Seniority and Age

Variable	Sum of squares	*df*	Mean square	*F*	*p*
Age					
Between groups	239.368	75	3.192	0.910	
Within groups	543.706	155	3.508		0.673
Total	783.074	230			
Seniority					
Between groups	268.573	75	3.581	1.162	0.217
Within groups	477.713	155	3.082		
Total	746.286	230			

Note. TPACK = technological pedagogical content knowledge.

In addition, ANOVA was applied to determine whether TPACK scores differed significantly by communication type (Table 13).

Table 13

TPACK Scores in Terms of Communication Type

Communication type	Sum of squares	*df*	Mean square	*F*	*p*
Between groups	73.567	75	0.981	1.163	0.215
Within groups	130.701	155	0.843		
Total	204.268	230			

Note. TPACK = technoloical pedagogical content knowledge.

The results showed that the average TPACK scores did not significantly differ depending on the online teaching mode communication type (synchronous, asynchronous, or both synchronous and asynchronous).

Discussion

This study investigated the instructors' TPACK development during the COVID-19 pandemic. The survey data show that while some types of TPACK knowledge was more developed, others were limited.

Data analysis shows that approximately 73% of participating instructors agreed on the positive perspectives about PK. It is remarkable that most of them agreed on their developments in CK and PCK. These findings indicate that non-technological knowledge was positively developed; 69.2% gave positive scores in regard to TPK, 73% for TCK, and 60% for TPACK. Surprisingly, approximately 58.8% of participants believed their TK had improved during pandemic, whereas the remainder felt their skills had stayed the same. Some researchers suggest that technological knowledge levels also indicate how often teachers keep up with technological developments (Dalal et al., 2017; Holland & Piper, 2016; Koh & Chai, 2016). Some instructors may have found it difficult to search and find appropriate technological tools to deliver their courses. As Li et al. (2015) have suggested, having few opportunities to deal with technological issues might influence knowledge about integrating technology at a limited level.

In order to learn concepts appropriately, instructors need to have PK, including knowledge of different course delivery methods. Thus, instructors can use different methods to design their courses, including collaborative interactive online activities for students' effective learning (Ferdig, 2006). Because this knowledge is a prerequisite for developing TPACK, the instructor must master it (Tanak, 2019). In this study, almost all instructors reported positive experiences about developing their PK and CK. This result was unexpected. There was in fact no change in the curriculum during the pandemic period. CK includes knowledge of concepts, facts, procedures, and theories; knowledge to combine and organize ideas; and knowledge of scientific evidence and facts (Mishra & Koehler, 2006). The majority of the instructors stated that they showed particular improvement in CK.

Therefore, it is assumed that the digital materials in different formats and the contents of the material that the instructors used in their online teaching contributed to the development of their CK beyond content delivery. The fact that the instructors perceived themselves as relatively less developed in TPK, TCK, and TPACK dimensions indicates that they may not have had enough time to learn new technologies or evaluate how they would teach students with these technologies during the two-term teaching process they were exposed to during the pandemic. Another reason might result from the fact that they used their existing technological knowledge, adapting the technologies they already knew or used during their teaching in the pandemic. Hsu et al. (2013) have also suggested that instructors with good training experience use various technologies. Thus, instructors may not have considered their use of these technologies as a development as they already knew how to use them before the pandemic and didn't compare their previous use to their use in a pandemic situation.

Instructors demonstrated positive perspectives, with an average of > 4.00 in all dimensions of TPACK. PCK had the highest score, with an average of 4.51, and TK had the lowest score, with an average of 4.04. Even though they are in different departments from faculties of education, the positive perspectives of the instructors regarding the pandemic process in terms of preparing and presenting

the content for online learning, using technologies for online teaching, and conducting their lessons in this way might result from the fact that they recognized online teaching during the pandemic as an opportunity to deliver teaching in a different way. Different institutions or departments likely had different training. However, instructors' evaluations of themselves as capable of conducting their courses online, even if they did not receive such training, may have resulted from the organizational principles, the internal motivation of the instructors, and the demands of the students. In addition, in-service training that instructors can quickly experience occur on platforms such as Zoom, Google Meet, Microsoft Teams, Moodle, and Blackboard, and institutions' technological support for online teaching may have played a role in their positive evaluations.

Within the TPACK framework, the instructors' evaluations can help determine the methods and technologies that will enable students to learn effectively and use the technologies where necessary for the planning, practising, and assessment stages of teaching. In general, the development regarding the TPACK framework has been realized at a high level.

On one hand, the fact that instructors needed to rely on such assessments may have prevented them from seeking new ways to improve themselves during the pandemic. On the other hand, responses to the item "I can lead my colleagues in the selection and use of appropriate methods and technologies" scored relatively lower than the other items. Also, the instructors of faculty of education may tend to apply new ways of learning by mixing them with their existing theoretical knowledge. However, an important reason why faculty members did not make positive evaluations about leading their colleagues regarding TPACK may be because they did not have enough time to test their own TPACK levels during this period, and the results of their practices were not yet clear.

Moreover, instructors' positive evaluations of TCK and TPK may be related to their abilities to use existing online teaching technologies knowledge and newly learned technologies to teach relevant content. This can be interpreted that they used technology not only for presenting content but also for building a student-centred environment. As PCK is defined as knowledge of the material, the reasons for choosing the material, and plans to teach the material to students (Dunlosky et al., 2013; Magnusson et al., 1999), in this dimension, there is no direct interaction with technology. Thus, the instructors' previous experiences can be reflected in ERT. At this point, it can be evaluated that during the pandemic period, instructors were able to use the teaching strategies they had already determined regarding many types of knowledge. Due to the static nature of CK, it was likely not easy for the instructors to develop CK in the context of the pandemic. Mourlam et al. (2021) have stated that prior knowledge (PCK) may not adequately meet the needs of a new context; however, instructors who responded to this study may have used available digital materials instead of creating their own digital content to quickly deliver lectures in some cases. Therefore, either the instructors' level of PCK at the time was sufficient to present the relevant content, or it was reconstructed in a positive way during the pandemic. When the content is mostly that of an operational and practising nature, instructors might use various Web 2.0 tools to deliver it. However, when the content is more static and theoretical, the tools for delivering this kind of content are limited. Thus, the type of content may have indirectly affected participants' use of various technologies used to present the content.

In many of the TPACK studies, the subdimensions somehow affect each other or may be a prerequisite for each other. Our findings accord with previous studies in that all components have a moderately positive relationship with each other (Tseng et al., 2022). When the components are examined separately, it can be said that the least significant relationship is between PCK and TK and that teaching

content does not change much with new technologies. In some studies, instructors' seniority is shown to correlate positively (Akturk & Saka Ozturk, 2019) or negatively (Karakaya & Avgin, 2016) with TPACK. In this study, it is noteworthy that that the seniority of the instructors did not result in significant differences for any component of TPACK. As Archambault and Crippen (2009) have suggested, instructors without online teaching experience were in the process of learning how to teach online. Instructors continued to find what worked best and were determined to keep trying different methods and strategies to do so. One reason for this may be that the higher education institutions' set principles to be followed for the pandemic period improved the instructors' TPACK to some extent. The institutions used different software, such as Blackboard, BigBlueButton, Cisco, and some other generic tools. In addition, there was no significant difference between the TPACK components among the instructors who delivered courses synchronously or asynchronously. In this framework, many institutions determine the LMS and live course environment to be used and developed as a framework for digital materials to be used. Therefore, instructors with low TPACK knowledge may not need to improve themselves, and those who are already at a high level may not need extra development to conduct lessons as there are predetermined frameworks and tools for online teaching.

Some prior studies have focused on the dimension of interaction in online learning and found that instructors should develop knowledge to enhance interaction (Evans & Myrick, 2015; Hew & Cheung, 2014). In this study, it is noteworthy that participants highly and positively evaluated items about technologies that would provide a better understanding of the subject within the framework of TPACK knowledge, the use of technologies suitable for the teaching method, and technologies that would enable students to study more willingly. Considering the interaction between students' understanding and motivation, the positive answers given to these items may also be related to the instructors' thinking that they had made progress in online teaching. These findings concur with results of previous work (Breslow et al., 2013; Koutropoulos et al., 2012; Liu et al., 2005) emphasizing the creation of a supportive online learning environment. Instructors might have mastered basic skills to use an online platform, which mainly focus on teaching knowledge about using all kinds of tools to strengthen instructor–student interactions in order to carry about more diverse online activities (Li et al., 2015). However, explanations for these different findings might be related to the fact that instructors carried out online teaching freely and personally in the previous studies, while in this study, the pandemic background made teachers to find quick solutions.

Overall, the improvements in TK, CK, PK, and TPK, TCK, and PCK during the pandemic are positively evaluated by the instructors. Positive average mean scores in these dimensions indicate that instructors' knowledge is high related to their abilities to use a variety of teaching strategies, to create materials, and to plan the scope and sequence of topics within their course. This finding of the present study is consistent with the findings reported by Elçi (2020) that the compulsory and urgent transition process does not seem to be much different than other transitions. In this study, among the important reasons for this finding are the results of the instructors' use of online tools, organizational factors, such as the motivation to be successful, as well as students' motivation for learning. Researchers suggest that the instructors became their own champions by developing their TPACK and practice in a limited time (Can & Silman-Karanfil, 2022).

This study helps explain instructors' experiences of a transition in their traditional classrooms to a novel online setting for which they were likely not prepared (Mourlam et al., 2021). An obvious limitation is that the sample size was relatively small. Deeper investigation about the target sample can be done by linking instructors' self-reported knowledge to their recent experiences in the pandemic period.

Conclusion and Implications

The purpose of this study was to examine educational faculty instructors' perspectives about their knowledge in the TPACK conceptual framework. Their ratings of their own knowledge in non-technological areas (PK, CK, and PCK) were relatively higher than those including technological knowledge (TK, TPK, and TCK). What is evident from the results is that instructors felt positive about issues related to TPACK. In Turkish educational institutions, the scores related to instructors' perspectives are positively correlated as the nature of TPACK involves a teaching knowledge. In the COVID-19 emergency situation, several contexts influenced in multiple ways such as using tools, seeking for new teaching approaches, creating new and unfamiliar situations that likely impacted instructors' skills to teach online.

Understanding how instructors' pedagogical and technological knowledge affect technology adoption is critical in facilitating effective integration of technology after the pandemic. In this study, during ERT, instructors somewhat reconstructed their TPACK, adapted their TPACK, or did not change previous TPACK in the context of planning lessons, using teaching strategies to convey content, and evaluating students' work. In this context, our results again confirmed that TPACK is a framework that should be used to examine instructors' knowledge of teaching online within not only new but also unfamiliar technologies. Overall, it can be concluded that the pandemic has been an opportunity to exercise ERT and evaluate challenges that emerge during emergencies, including ones that may happen in the future.

Ultimately, instructors need to have sufficient knowledge of technology, pedagogy, and content to teach online effectively. The importance of instructors' training on the TPACK framework emerges as a key factor for effective ERT considering the changes required from conventional online teaching practices. Therefore, a systematic training initiative should be provided to holistically develop instructors' TPACK required to deliver their courses efficiently in emergency situations. Moreover, TPACK, with its components, will also assist instructors in their decision-making in emergency cases that require them to take actions towards delivering effective courses in changing situations and environments. We hope this study brings new insights regarding instructors' current TPACK developments and that it helps provide an understanding of the demanding circumstances present in emergency teaching situations.

References

Ahtiainen, R., Eisenschmidt, E., Heikonen, L., & Meristo, M. (2022). Leading schools during the COVID-19 school closures in Estonia and Finland. *European Educational Research Journal*, 1-18.

Akturk, A. O., & Saka Ozturk, H. (2019). Teachers' TPACK levels and students' self-efficacy as predictors of students' academic achievement. *International Journal of Research in Education and Science (IJRES)*, *5*(1), 283–294.

Archambault, L., & Crippen, K. (2009). Examining TPACK among K–12 online distance educators in the United States. *Contemporary Issues in Technology and Teacher Education*, *9*(1), 71–88. https://www.learntechlib.org/primary/p/29332/

Arcueno, G., Arga, H., Manalili, T. A., & Garcia, J. A. (2021, July 7–9). *TPACK and ERT: Understanding teacher decisions and challenges with integrating technology in planning lessons and instructions*. DLSU Research Congress 2021, De La Salle University, Manila, Philippines. https://login.easychair.org/publications/preprint_download/STc4

Barbour, M. K., LaBonte, R., Hodges, C. B., Moore, S., Lockee, B. B., Trust, T., Bond, M. A., Hill, P., & Kelly, K. (2020, December). *Understanding pandemic pedagogy: Differences between emergency remote, remote, and online teaching*. State of the Nation: K–12 e-Learning in Canada. http://hdl.handle.net/10919/101905

Breslow, L., 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. *Journal of Research & Practice in Assessment*, *8*, 13–25. https://eric.ed.gov/?id=ej1062850

Can, I., & Silman-Karanfil, L. (2022). Insights into emergency remote teaching in EFL. *ELT Journal*, *76*(1), 34–43. https://doi.org/10.1093/elt/ccab073

Canbazoglu Bilici, S., Guzey, S. S., & Yamak, H. (2016). Assessing pre-service science teachers' technological pedagogical content knowledge (TPACK) through observations and lesson plans. *Research in Science and Technological Education*, *34*(2), 237–251. https://doi.org/10.1080/02635143.2016.1144050

Cheng, K.-H. (2017). A survey of native language teachers' technological pedagogical and content knowledge (TPACK) in Taiwan. *Computer Assisted Language Learning*, *30*(7), 692–708. https://doi.org/10.1080/09588221.2017.1349805

Ciptaningrum, D. S. (2017). The development of the survey of technology use, teaching, and technology-related learning experiences among pre-service English language teachers in Indonesia. *Journal of Foreign Language Teaching & Learning*, *2*(2), 11–26. https://doi.org/10.18196/ftl.2220

Dalal, M., Archambault, L., & Shelton, C. (2017). Professional development for international teachers: Examining TPACK and technology integration decision making. *Journal of Research on Technology in Education*, *49*(3–4), 117–133. https://doi.org/10.1080/15391523.2017.1314780

Dunlosky, J., Rawson, K. A., Marsh, E. J., Nathan, M. J., & Willingham, D. T. (2013). Improving students' learning with effective learning techniques: Promising directions from cognitive and educational psychology. *Psychological Science in the Public Interest*, *14*(1), 4–58. https://doi.org/10.1177/1529100612453266

Elçi, A. (2020). An urgency for change in roles: A cross analysis of digital teaching and learning environments from students and faculty perspective. In E. Alqurashi (Ed.), *Handbook of research on fostering student engagement with instructional technology in higher education* (pp. 462–483). IGI Global. https://doi.org//10.4018/978-1-7998-0119-1.ch025

Evans, S., & Myrick, J. G. (2015). How MOOC instructors view the pedagogy and purposes of massive open online courses. *Distance Education*, *36*(3), 295–311. https://doi.org/10.1080/01587919.2015.1081736

Ferdig, R. E. (2006). Assessing technologies for teaching and learning: Understanding the importance of technological pedagogical content knowledge. *British Journal of Educational Technology*, *37*(5), 749–760. https://doi.org/10.1111/j.1467-8535.2006.00559.x

Ferri, F., Grifoni, P., & Guzzo, T. (2020). Online learning and emergency remote teaching: Opportunities and challenges in emergency situations. *Societies*, *10*(4), Article 86. https://doi.org/10.3390/soc10040086

Getenet, S. T., Beswick, K., & Callingham, R. (2016). Professionalizing in-service teachers' focus on technological pedagogical and content knowledge. *Education and Information Technologies*, *21*(1), 19–34. https://doi.org/10.1007/s10639-013-9306-4

Giannakos, M. N., Doukakis, S., Pappas, I. O., Adamopoulos, N., & Giannopoulou, P. (2015). Investigating teachers' confidence on technological pedagogical and content knowledge: An initial validation of TPACK scales in K–12 computing education context. *Journal of Computers in Education*, *2*, 43–59. https://doi.org/10.1007/s40692-014-0024-8

Harris, J., & Hofer, M. (2009). Instructional planning activity types as vehicles for curriculum-based TPACK development. In I. Gibson, R. Weber, K. McFerrin, R. Carlsen, & D. Willis (Eds.), *Proceedings of SITE 2009—Society for Information Technology & Teacher Education International Conference* (pp. 4087–4095). Association for the Advancement of Computing in Education (AACE). https://www.learntechlib.org/p/31298/

Haviz, M., Maris, I. M., & Herlina, E. (2020). Relationships between teaching experience and teaching ability with TPACK: Perceptions of mathematics and science lecturers at an Islamic university. *Journal of Science Learning*, *4*(1), 1–7. https://eric.ed.gov/?id=EJ1281833

Hew, K. F., & Cheung, W. S. (2014). Students' and instructors' use of massive open online courses (MOOCs): Motivations and challenges. *Educational Research Review*, *12*, 45–58. https://doi.org/10.1016/j.edurev.2014.05.001

Hodges, C. B., & Fowler, D. J. (2020). COVID-19 crisis and faculty members in higher education: From emergency remote teaching to better teaching through reflection. *International Journal*

of Multidisciplinary Perspectives in Higher Education, *5*(1), 118–122. https://doi.org/10.32674/jimphe.v5i1.2507

Holland, D. D., & Piper, R. T. (2016). A technology integration education (TIE) model for millennial preservice teachers: Exploring the canonical correlation relationships among attitudes, subjective norms, perceived behavioral controls, motivation, and technological, pedagogical, and content knowledge (TPACK) competencies. *Journal of Research on Technology in Education*, *48*(3), 212–226. https://doi.org/10.1080/15391523.2016.1172448

Horzum, M. B., Akgün, Ö. E., & Öztürk, E. (2014). The psychometric properties of the technological pedagogical content knowledge scale. *International Online Journal of Educational Sciences*, *6*(3), 544–557. https://doi.org/10.15345/iojes.2014.03.004

Hsu, C. Y., Liang, J. C., Chai, C. S., & Tsai, C. C. (2013). Exploring preschool teachers' technological pedagogical content knowledge of educational games. *Journal of Educational Computing Research*, *49*(4), 461–479. https://doi.org/10.2190/EC.49.4.c

Juanda, A., Shidiq, A. S., & Nasrudin, D. (2021). Teacher learning management: Investigating biology teachers' TPACK to conduct learning during the COVID-19 outbreak. *Jurnal Pendidikan IPA Indonesia / Indonesian Journal of Science Education*, *10*(1), 48–59. https://doi.org/10.15294/jpii.v10i1.26499

Karakaya, F., & Avgin, S. S. (2016). Investigation of teacher science discipline self-confidence about their technological pedagogical content knowledge (TPACK). *European Journal of Education Studies*, *2*(9). https://doi.org/10.5281/zenodo.165850

Koehler, M., & Mishra, P. (2009). What is technological pedagogical content knowledge (TPACK)? *Contemporary Issues in Technology and Teacher Education*, *9*(1), 60–70. https://www.learntechlib.org/primary/p/29544/

Koehler, M. J., Mishra, P., & Cain, W. (2013). What is technological pedagogical content knowledge (TPACK)? *Journal of Education*, *193*(3), 13–19. https://doi.org/10.1177/002205741319300303

Koh, J. H. L., & Chai, C. S. (2016). Seven design frames that teachers use when considering technological pedagogical content knowledge (TPACK). *Computers & Education*, *102*, 244–257. https://doi.org/10.1016/j.compedu.2016.09.003

Koutropoulos, A., Gallagher, M. S., Abajian, S. C., de Waard, I., Hogue, R. J., Keskin, N. Ö., & Rodriguez, C. O. (2012). Emotive vocabulary in MOOCs: Context and participant retention. *European Journal of Open, Distance and E-Learning*, *15*(1). https://eric.ed.gov/?id=EJ979609

Liu, X., Bonk, C. J., Magjuka, R. J., Lee, S., and Su, B. (2005). Exploring four dimensions of online instructor roles: A program level case study. *Online Learning*, *9*(4), 29–48. https://doi.org/10.24059/olj.v9i4.1777

Lamminpää, M. (2021). *Exploring Finnish EFL teachers' perceived technological pedagogical content knowledge (TPACK) following emergency remote teaching: A quantitative approach* [Master's thesis, University of Turku]. UTUPub. https://urn.fi/URN:NBN:fi-fe2021050428691

Li, Y., Zhang, M., Bonk, C. J., & Guo, Y. (2015). Integrating MOOC and flipped classroom practice in a traditional undergraduate course: Students' experience and perceptions. *International Journal of Emerging Technologies in Learning*, *10*(6), 4–10. https://doi.org/10.3991/ijet.v10i6.4708

Magnusson, S. J., Borko, H., & Krajcik, J. S. (1999). Nature, sources, and development of pedagogical content knowledge for science teaching. In J. Gess-Newsome & N. Lederman (Eds.), *Examining Pedagogical Content Knowledge* (pp. 95-132). Boston, MA: Kluwer Press.

Mishra, P., & Koehler, M. J. (2006). Technological pedagogical content knowledge: A framework for teacher knowledge. *Teachers College Record*, *108*(6), 1017–1054. https://doi.org/10.1111/j.1467-9620.2006.00684.x

Mourlam, D., Chesnut, S., & Bleecker, H. (2021). Exploring preservice teacher self-reported and enacted TPACK after participating in a learning activity types short course. *Australasian Journal of Educational Technology*, *37*(3), 152–169 https://doi.org/10.14742/ajet.6310

Oliver, M. (2011). Handbook of technological pedagogical content knowledge (TPCK) for educators. *Learning, Media and Technology*, *36*(1), 91–93. https://doi.org/10.1080/17439884.2011.549829

Sang, G., Tondeur, J., Chai, C. S., & Dong, Y. (2016). Validation and profile of Chinese pre-service teachers' technological pedagogical content knowledge scale. *Asia-Pacific Journal of Teacher Education*, *44*(1), 49–65. https://doi.org/10.1080/1359866X.2014.960800

Shulman, L. S. (1986). Those who understand: Knowledge growth in teaching. *Journal of Education*, *15*(2), 4–14. https://doi.org/10.3102/0013189X015002004

Supiano, B. (2020, April 30). Why you shouldn't try to replicate your classroom teaching online. *The Chronicle of Higher Education*. https://www.chronicle.com/newsletter/teaching/2020-04-30

Tanak, A. (2019). Designing TPACK-based course for preparing student teachers to teach science with technological pedagogical content knowledge. *Kasetsart Journal of Social Sciences*, *41*(1), 53–59. https://doi.org/10.1016/j.kjss.2018.07.012

Thomas, M S., & Rogers, C. (2020) Education, the science of learning, and the COVID-19 crisis. *Prospects*, *49*, 87–90. https://doi.org/10.1007/s11125-020-09468-z

Tseng, J. J., Chai, C. S., Tan, L., & Park, M. (2022). A critical review of research on technological pedagogical and content knowledge (TPACK) in language teaching. *Computer Assisted Language Learning*, *35*(4), 948-971. https://doi.org/10.1080/09588221.2020.1868531

Tyarakanita, A. (2020). A case study of pre-service teachers' enabling TPACK knowledge: Lesson design projects. *ELS Journal on Interdisciplinary Studies in Humanities*, *3*(2), 158-169.

Valtonen, T., Sointu, E., Kukkonen, J., Kontkanen, S., Lambert, M. C., & Mäkitalo-Siegl, K. (2017). TPACK updated to measure pre-service teachers' twenty-first century skills. *Australasian Journal of Educational Technology*, *33*(3). https://doi.org/10.14742/ajet.3518

Verawardina, U., Asnur, L., Lubis, A. L., Hendriyani, Y., Ramadhani, D., Dewi, I. P., & Sriwahyuni, T. (2020). Reviewing online learning facing the COVID-19 outbreak. *Journal of Talent Development and Excellence*, *12*, 385–392.

Voogt, J., Fisser, P., Pareja Roblin, N., Tondeur, J., & van Braak, J. (2013). Technological pedagogical content knowledge—A review of the literature. *Journal of Computer Assisted Learning*, *29*(2), 109–121. https://doi.org/10.1111/j.1365-2729.2012.00487.x

International **R**eview of **R**esearch in **O**pen and **D**istributed **L**earning
Volume 24, Number 2

May – 2023

Book Review: Metaphors of Ed Tech

Author: Martin Weller (Athabasca University Press, 2022, 200 pages) https://doi.org/10.15215/aupress/9781771993500.01

Reviewed by: Dominic Orr, Nova Gorica University, Slovenia

How often has online learning been compared to Netflix, Uber, or Amazon in the past three years of the Covid pandemic? Although Martin Weller does not answer this question quantitatively, he sets out in *Metaphors of Ed Tech* to make us aware that any metaphor is value-laden and expresses a particular perspective on a subject area or social phenomenon. But metaphors can also be useful. They encourage people to use mental models they have about things they know well to reframe their ideas about subject areas or social phenomena they do not know—or, indeed, that they are used to thinking about in a certain way. Consider the change of perspective when we use the mental model of a lecture, a newspaper, or a streaming service to review the potentials and risks of online learning. Weller refers to this practice which people use to review and construct their own perspective on the practiced relationship in an educational setting as using a "mental sandpit."

Following from Weller's companion publication 25 Years of Ed Tech (2020), *Metaphors of Ed Tech* aims to facilitate a critical take on how educational technology (ed tech) is being used in educational settings and to help expose how the debate around these practices is framed. This objective is driven by Weller's motivation to provide an academic method of reviewing developments in educational technology—given the current lack of agreed-upon terminologies, non-recognition of academic insights from the past, and neglect of power relationships underlying technological solutions—as well as to overcome the utilitarian way digital technology is often discussed. At the same time, Weller is wary of the idea of ed tech becoming a discipline. He argues that ed tech needs to remain more open to fully account for the dynamic and ever-changing developments in the field of digital technology and in our social relationship to digital tools. This openness will also ensure that the community is inclusive of all critical voices and does not shut these out as part of the norming processes behind creating a discipline. Weller states, "Ed tech is rich precisely because people enter it from different fields, bringing a range of perspectives to bear, and [because] it is applied to different disciplines that have their own requirements and challenges." (p. 48) In his conclusion, he cites Watters' (2016) argument that ed tech should remain an "undiscipline."

Weller considers metaphors as a strong method for bringing in this range of perspectives. The question remains whether this approach works for the reader? Does it make the ideas and arguments in the book more accessible? Certainly, the book presents many common metaphors about education technology throughout. In chapter 5, for instance, some common metaphors are clustered around the idea that ed tech is the salvation from an oncoming educational apocalypse. As Weller states, the ones pushing this idea within this narrative are often given religious titles in popular parlance: they are "evangelists" who use these metaphors as a method of successfully implementing their preferred solution. In the end, however, Weller argues that it may be that the rather humdrum learning management system has the

greatest impact on access to and quality of learning, even though the evangelist is more likely to be pushing for a blockchain-based solution.

For strong proponents of open education, it certainly is helpful to hear from Weller about common metaphors used to make this seemingly esoteric and fuzzy idea (characterisation of this author, not a quote from the book) more concrete in chapter 6. For instance, Weller considers the metaphor of the educator as a DJ curating a "playlist"—a selection of different songs connected by design. With this example, as with others, Weller also reminds the reader that metaphors can become too strong, with people paying too much attention to the comparative object used instead of seeing the use of metaphor as a mapping exercise with purpose of offering a certain perspective on ed tech.

A number of metaphors strewn throughout the book are Weller's own invention. He suggests "mudlarking" as an analogy for the undiscipline of ed tech, a Welsh castle as an analogy for reputation signalling used by new ed tech companies wanting to link to existing educational legacies, and "Jaws" (with reference to the shark) as the challenge posed by COVID-19 to a fragile educational ecosystem. These are entertaining and certainly fulfil their purpose of asking us to re-frame our perspective on phenomena in the educational system.

The final question is what impact this book could have on the field of educational technology. Weller refers to the educational technologist who needs to "appreciate what is important and useful in new technological developments and to separate them from the pro- or anti-technology rhetoric" (p. 57). While the use of metaphors certainly encourages this critical reflection process, the example of the reframing of the pedagogical concept of a massive open online course (MOOC) is perhaps the most instructive. The first waves of social research on MOOCs equated them to formal education (relating them to the metaphor of lecture or university course) and criticized their high drop-out rates. A new metaphor from Downes (2014) proposing to view MOOCs like newspapers opens up the concept and encourages rethinking what success might mean for a MOOC, and therefore how to measure impact. Thus, this book and the purposeful use of and reflection on metaphors it encourages can hopefully lead to better research and development.

References

Downes, S. (2014, March 21). Like reading a newspaper. *Half an Hour*. https://halfanhour.blogspot.com/2014/03/like-reading-newspaper.html

Watters, A. (2016, September 9). Re·con·figures: The pigeons of ed-tech. https://hackeducation.com/2016/09/22/pigeon

International **R**eview of **R**esearch in **O**pen and **D**istributed **L**earning
Volume 24, Number 2

May – 2023

Book Review: Teaching in a Digital Age: Guidelines for Designing Teaching and Learning–Third Edition

Author: Anthony William (Tony) Bates (Tony Bates Associates Ltd., 2022, 1045 pages)., ISBN: 978-0-9952692-7-9 (e-book).
https://pressbooks.pub/teachinginadigitalagev3m/

Reviewed by: Mohsen Keshavarz[1*], and Zohrehsadat Mirmoghtadaie[2]
1Department of E-Learning in Medical Sciences, School of Paramedical Sciences, Torbat Heydariyeh University of Medical Sciences, Torbat Heydariyeh, Iran, corresponding author; [2]Assistant Professor, Department of e-learning, Virtual School of Medical Education and Management, Shahid Beheshti University of Medical Sciences (SBMU), Tehran, Iran.

A Short Description to the Book

Teaching in a Digital Age is a book written by Anthony William (Tony) Bates and is licensed under a Creative Commons CC BY-NC license. The first edition was published in April 2015, the second edition was published in 2019, and the third edition of the book was released on 18 August 2022.

The author of the book is a prominent contemporary scholar in the field of technology-enhanced learning. *Teaching in the Digital Age*, one of his most important books, has received considerable attention around the world. Most educational designers and instructors in the field of digital learning use the book as a practical guide in the educational design of digital environments, and it is an authoritative source in the field of online teaching. The book introduces the principles for effective teaching in an online environment, providing instruction and guidance for instructors on online teaching and learning. It presents good practice guidelines for redesigning teaching and enables teachers and instructors to develop the knowledge and skills they need in a digital age. This valuable collection has been translated into different languages around the world—including versions available in Spanish, Vietnamese, French, Persian, Chinese, Turkish, Portuguese, and Japanese—and is available on the BCcampus website in Canada as an open access text.

Relationship and Importance to the Field of Distributed/ Hybrid Learning

In line with the importance of the book, coaches and professors today face new challenges in the field of education and must use new educational technologies in teaching. The size of classrooms has increased; students of different ages enter the education system and are often working while studying. The expectations of students and teachers have completely changed from each other and students must have digital skills; also, educators must respond to all these changing needs and use new educational technologies in their teaching to create more flexibility in the educational system.

To manage new classes in the digital age, educators must be aware of the theories and principles of educational design to use these principles in the redesign of modern classes. Teachers should know that

the nature of knowledge has changed in the new era. Because of this change, educators need different perspectives in teaching. They must be able to train learners with new skills in the digital age. They have to decide when to use face-to-face, blended, or fully online teaching and what teaching methods are best in technology-based environments. Instructors are expected to know the possibilities of teaching through the use of massive open online courses (MOOCs), open educational resources, and open textbooks.

In general, *Teaching in a Digital Age* is considered a comprehensive book and a basic guide for teachers. It instructs them on the principles of effective teaching in the digital age, providing a practical framework for educators to make decisions on the best teaching methods.

The Book's Structure

The book consists of 15 chapters, each concluding with key "takeaways" and a complete set of references. Most chapter sections end with an activity, and there are also scenarios throughout the book. These are semi-fictional, most of them based on an actual example.

Chapter 1 is a foundation for other chapters and deals with the basic topics of education in the digital age. In particular, it explains the key knowledge and skills that students need in the digital age, arguing that technology plays a decisive role in today's teaching process.

Chapters 2 to 4 emphasize the theoretical principles and foundations of teaching and learning and their applications in the digital age. Chapter 2 discusses the relationship between views on the nature of knowledge and the way we decide to teach. Chapter 3 describes several different methods of teaching used in school- and campus-based teaching and discusses the general strengths and weaknesses of campus-based methods. Chapter 4 describes key approaches to the design of online teaching and learning and analyzes the ADDIE model, online collaborative learning, competency-based learning, and communities of practice for teaching in a digital age.

Chapters 5 to 9 help teachers make the right decisions in choosing media and educational technologies in the teaching process. Chapter 5 has a special focus on the concept of MOOCs and explains its applications in higher education. Chapter 6 describes the main components of an effective learning environment for implementing teaching and learning in the digital age. Chapter 7 emphasizes understanding the nature and role of media and technologies in education. Bates believes that media are different in terms of form, symbol systems, and cultural values, arguing that there are generally six common media in education: face-to-face teaching, text, graphics, audio, video, and computing (animation, simulation, virtual reality, and artificial intelligence). Chapter 8 includes pedagogical differences between media and provides a framework of analysis for determining appropriate pedagogical roles for different media. Bates believes that text, audio, video, computing, and social media all have unique educational affordances for teaching and learning, and that the choice or combination of media depends on the overall teaching philosophy. Chapter 9 examines emerging technologies such as social media, artificial intelligence, virtual/augmented reality, and serious/educational games. Bates believes that these new technologies can improve student motivation and teach tasks that would otherwise be difficult.

The main purpose of chapter 10 is to provide a framework for making effective decisions about the choice and use of media for teaching and learning. The framework used is the SECTIONS model, which stands for students, ease of use, costs, teaching functions, interaction, organizational issues, networking, and security and privacy.

Chapter 11 focuses on modes of delivery and helps teachers to determine the most appropriate mode of delivery for any course or program, emphasizing that there is a continuum of technology-based learning, from "pure" face-to-face teaching to fully online programs.

Chapter 12 examines the potential implications of recent developments in open content, open publishing, open data, and open research. Bates believes that the increasing availability of OER, open textbooks, open research, and open data means that in future almost all academic content will be freely accessible over the Internet.

Chapters 13 to 14 focus on quality in teaching and suggest nine pragmatic steps for designing and delivering quality teaching in a highly digital teaching context. Chapter 14 very briefly examines the policy and operational support needed from schools, colleges, and universities to ensure relevant and high-quality teaching in a digital age. Finally, chapter 15 provides a summary of the main issues the book attempts to address.

Highlights of the New Edition

A distinctive feature of the third edition of *Teaching in the Digital Age* is its discussion of the impact of COVID-19 on teaching and learning. Bates believes that the arrival of the virus and the closure of universities and schools accelerated the approach of using new educational technologies such as synchronous and asynchronous tools in teaching and learning. COVID-19 provided many lessons to universities and schools in the field of online learning and teaching – the author believes that the presentation of these experiences needs a separate chapter and he tried to express all these experiences in chapter 1.8.

In general, the third edition is distinguished from previous editions by addressing new issues such as successes and failures arising from the emergency pivot to remote learning during the COVID-19 pandemic, open pedagogy, micro-credentials, the difference between synchronous and asynchronous learning, and emerging technologies to enhance learning and teaching. All changes to the first edition made for the second edition are in green text, and the changes for this third edition are in blue text, so the reader can follow the changes more easily.

One of the features of this e-book is how easy it is to use: the reader can access the content list by referring to the taskbar on the left side of this book on the BC campus website and entering that chapter by clicking on the desired section and topic. Perhaps such features are less common in e-books because most are limited to a PDF version of the book on the website. Another distinctive and unique feature of this e-book is access to its translations in other languages.

Conclusion

This book has many audiences, but primarily targets teachers and professors who face various challenges in teaching in the digital age. Today, the shape of classrooms has changed fundamentally: the number of students has increased, the age group of students has changed, and most students are employed. Educational technology is one of the main components of teaching, and teaching methods have changed. In addition, the knowledge component has become the main part of job. Learners are looking for knowledge-based specialized programs, and curricula must respond to the needs of the labour market.

This book tries to provide appropriate answers and solutions for the challenges teachers face in new classes. Moreover, as a guidebook on choosing the best teaching methods and use of technology in the digital age, it provides teachers with the necessary instructions. One of the prominent features of this book is its openness as a source. Bates has provided examples of concepts and ideas in the field of technology-enhanced learning, using a combination of text, photos, and videos with hyperlinks to present these, making them very clear and relevant. The structure of the book also has a logical order and sequence. And the overall presentation of the book also includes attractive images, pictures, photos, and videos to help the reader understand the whole subject in context. Finally, the references in the book are up-to-date. Bates has presented international experience in the field of e-learning in England, Canada, and around the world. In general, this book is a must for every teacher, especially in the fields of blended, online, and hybrid learning .

International **R**eview of **R**esearch in **O**pen and **D**istributed **L**earning
Volume 24, Number 2

May – 2023

Partnering Higher Education and K–12 Institutions in OER: Foundations in Supporting Teacher OER-Enabled Pedagogy

Kelly Arispe, Ph.D. and Amber Hoye, M.E.T.
Boise State University

Abstract

Open educational resources (OER) are disproportionately created and/or accessed by institutions of higher education as compared to K–12 even though teachers confront the challenge of outdated teaching materials or, worse, an increasing trend by school districts to discontinue textbook adoption altogether. In this paper, we describe a sustainable and innovative example of OER-enabled pedagogy (OEP) that partners teachers and students across institutional boundaries to address these problems. The Pathways Project (PP) is a higher education and K–12 community of 350 world-language teachers, students, and staff that engage in the 5Rs (retain, reuse, revise, remix, and redistribute) of OEP with a repository of more than 800 OER ancillary activities that support standards-based pedagogy for 10 world languages and cultures. The PP is innovative because it fosters renewable assignments for the entire disciplinary ecosystem unlike most OEP studies that discuss renewable assignments limited to a single course. Teacher education is one of the best places to engage OEP because teachers are trained to personalize and contextualize OER materials for their local classroom needs. In so doing, the PP community receives timely discipline-specific professional development that is in high demand, especially in rural communities where teachers are isolated. Higher education-K–12 OEP partnerships are rare, and yet teacher education programs exist in most universities and can be a logical place to start. This paper provides concrete examples and practical steps that are transferable to other disciplines looking to engage in similar types of OER-OEP collaboration and community engagement.

Keywords: OEP, renewable assignments, teacher education, K–12, higher education

Introduction

One of the challenges facing U.S. institutions of higher education is collaborating with external communities to solve complex problems with outcomes that are mutually beneficial (Allan, 2021; Gimbel 2018). This is especially the case for institutions in rural states of the U.S. where the urban-rural divide is increasing, and communities may be suspicious of the value higher education has to offer (Parker, 2019). Furthermore, K–12 public institutions, especially those in rural communities, have a serious resource problem (Tomlinson, 2020). School districts are increasingly discontinuing textbook adoption while changing curricula to norm to updated standards. As a result, teachers can be left with the burden of creating their own materials with little time and training to do this well.

Open educational resources (OER) can be a bridge for community outreach and K–16[1] engagement through strategic teacher education. The Pathways Project (PP; https://www.boisestate.edu/pathwaysproject/) is an open educational resource (OER) that was created in 2018 to address these challenges and to engage K–12 and higher education educators, undergraduate students, and academic staff in a partnership fundamentally rooted in OER-enabled pedagogy (OEP). OEP is a constructivist process characterized by the 5Rs (retain, reuse, revise, remix, and redistribute) whereby using and creating OER materials is at the nexus of discipline-specific professional development that results in quality teaching materials in high demand.

Unfortunately, across K–12 institutions in the United States, two-thirds of teachers have no awareness of OER (Seaman & Seaman, 2022). This contrasts with growth in OER awareness in higher education institutions that report a 20% increase in awareness over the last five years (57% in 2022 compared to 37% in 2017). It is safe to assume that OEP, which is active engagement in the process, not solely awareness of OER, is even lower. Teacher education is a logical place to address these challenges, yet a recent survey revealed only 1% of teacher education courses use OER and only two survey respondents reported offering student teachers the opportunity to participate in the OER creation process in their courses (Van Allen & Katz, 2020).

This disparity no doubt is responsive to the paucity of research and innovative praxis focused on teacher education and OEP in general. Recent scholarship has focused on OEP and renewable assignments as a learning outcome tied to a specific course in teacher education programs (Van Allen & Katz, 2019). Renewable assignments are student work that is created for a greater audience and purpose than a singular course. For example, they can be integrated into or remixed in subsequent semesters for the benefit of future students.

The PP is an example of OEP that provides a nuanced approach to renewable assignments and OEP in general, primarily with regards to scope. The process of OEP leads to renewable materials that are openly shared with a larger, global community of world-language educators. The PP is integrated into several higher education courses, undergraduate internship opportunities, and in-service teacher development workshops and training. As a result, renewable assignments take on a whole new meaning because they are not limited to a specific course topic or even a core curriculum. This is largely because the PP OER is a repository of over 800 face-to-face and online ancillary classroom activities that support standards-based pedagogy for 10 world languages and cultures. Each activity follows a standard design protocol based on best practices in world-language teaching and aligns with state and national standards. Furthermore, every activity contains all materials needed for classroom implementation,

making the process of revising or remixing activities more practical and accessible so that teachers can adapt materials to meet the needs of their specific learners.

This paper provides important contributions to contexts where there is little to no OEP scholarship. There is an overwhelmingly disproportionate representation of OEP in STEM or business and little to none in the humanities. For example, a recent meta-analysis on K–12 OER research studies found only one instance of humanities content included (Blomgren & McPherson, 2018). Furthermore, most research is focused on contexts within higher education that measure the impact of OER textbooks rather than examining the effectiveness of ancillary materials even though ancillary materials are more highly regarded by K–12 teachers for their customizability (Blomgren, 2018). Most importantly, the PP bridges the gap between institutions of higher education and K–12 and, in this way, provides insights applicable to any discipline and for every level of education.

OER-Enabled Pedagogy

OEP is a process rooted in constructivist principles of learning whereby users learn by doing and for a purpose (Van Allen & Katz, 2019; Wiley et al., 2017; Wolfenden & Adinolfi, 2019). OEP products contribute to a real-world purpose; for example, the materials created might respond to an authentic need in the learning community and be accessible to an audience beyond the immediate context. At the core, OEP should produce renewable resources that contribute to a repository for future use. OEP is most often described in the literature involving undergraduate student learners as the users and course materials as the content created; students work on renewable assignments that are then integrated into coursework for future semesters. Students learn how to openly license and share their materials which is the evidence of the learning outcomes.

Teachers, like students, can also participate in OEP and, in so doing, participate in transformative pedagogical practices where continuous learning and professional development are also outcomes. OEP is digital scholarship and fundamentally different from teaching with copyrighted materials because it requires teachers "to be consciously engaged in either building upon work previously done by another or to construct a new public entity that explicitly provides other learners permission to publicly transform and adapt it" (Wiley et al., 2017, p. 136). It is this level of conscientious engagement that differs from more traditional professional development experiences. Teachers take ownership of their investment because they recognize that they both reap the benefits of their contributions and that they are supporting future teachers by sharing their work for future use.

OEP can also respond to important resource challenges facing K–12 landscapes. Textbook adoptions are expensive, and professional development workshops don't always address critical content needs for teachers of specific disciplines. Furthermore, textbooks are often lacking or lag when it comes to diverse representation, whether it be through the images selected or the perspectives that are presented. This is especially concerning for world-language teachers who are trying to facilitate and foster intercultural competence as one of the main learning objectives. Finally, textbooks are costly, and K–12 school districts have increasingly chosen either not to acquire a newer edition (further outdating and complicating the diversity problem) or to do away with textbooks altogether. This trend is disproportionately impacting rural communities and especially in disciplines like world languages that tend to offer fewer courses and may have one or two teachers for the entire district. Considering the recent COVID-19 pandemic, Van Allen and Katz (2020) remarked that "now is the opportune time to

introduce educators to OER and advocate for its use over commercially published materials that are being made freely available during the crisis" (p. 215). What is more, teachers don't do this in isolation; rather, they collaborate with one another for the purpose of long-term renewable use.

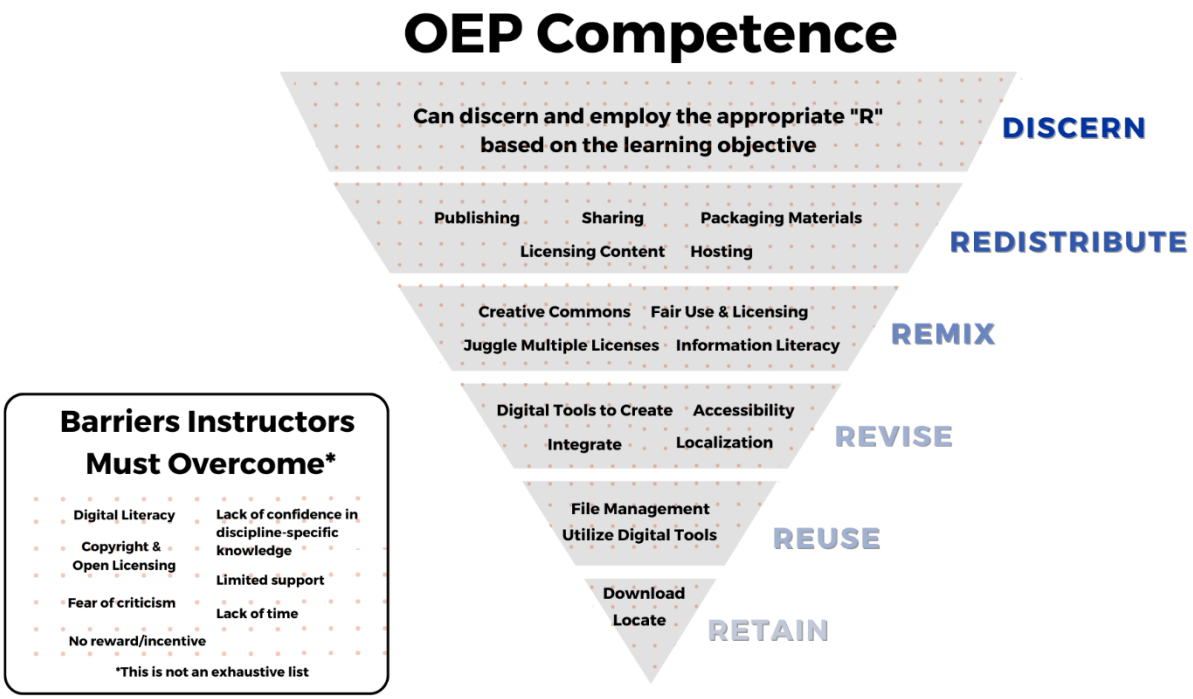
OEP Is a Competence Rooted in Process, not Product

One of the challenges facing teacher educators wishing to use OEP as a transformational pedagogical experience is to set clear expectations about the nature of the OEP process. Most teachers are initially drawn to OER because it can save time by not having to create materials from scratch. While this is certainly true, the most compelling argument for engaging in OEP is that it is content-specific professional development rooted in learning by doing and socially constructed (Wolfenden & Adinolfi, 2019).

OEP is a process that moves the teacher from passive "taker" to active "engager" whereby the teacher can discern which "R" to employ based on the OER material(s) and the learning objective at hand. Unlike scouring the Internet for a single stand-alone material, OER materials are designed to be modified and become more pedagogically useful when adapted, not just adopted. Teachers negotiate their individual needs through the ways they localize the OER materials for their learners and according to the tasks/learning objectives. For example, they can infuse their own creative and subject-matter expertise to transform materials into something that is more contextualized and efficacious for their personal teaching environment. At its most profound level, the teacher is participating in collective practices that contribute to the potential for continued localization by future teachers engaging in OEP. However, to do so requires a certain level of OEP competence. As depicted in Figure 1, we characterize the 5 Rs through an inverted pyramid whereby the skills practiced at the upper echelon of the pyramid encompass the skills below. For example, a teacher wanting to remix an OER material will first need to retain, reuse, and revise the material so that she can remix it with other materials. Although the skills differ and grow in complexity with each of the R competencies, teachers may encounter the barriers listed at any point or multiple points along the way. The goal in OEP competence is not necessarily to have teachers revise and remix *every* OER material. Rather, it is for the teacher to know *when* to use *which* R for the *right* pedagogical purpose. Therefore, OEP must be firstly rooted in pedagogical understanding in the discipline. This foundation is the filter by which the teacher can decipher how to operationalize OEP.

Figure 1

Teacher OER Competence: The 5 Rs of OEP



As described above, the potential outcomes that spring from OEP should never be reduced solely to their products (OER materials). Teacher educators can help dispel this myth and prepare teachers to understand the OEP process with realistic expectations. At the same time, at a system level, higher education institutions should also consider how they make this work more visible and accessible by providing academic credit through online, informal OER/OEP coursework. A recent report on micro-credentialing by UNESCO chairs (see McGreal et al., 2022) details the affordances and barriers to consider in making this work count and to elevate more equitable professional learning opportunities for all teachers, regardless of place and time, online. In the PP context specifically, K–12 teachers engaging in the 2022–2023 National Endowment for the Humanities (NEH) grant activities earned one credit of academic professional development from the host institution. Furthermore, the directors awarded badges (https://badgr.com/public/issuers/JWCzlrrZTC6lO7UOjxsIJQ/badges) through Badgr (https://badgr.com/) that highlighted the course learning outcomes and provided evidence of OEP skills developed in the process.

While professional development and institutional support through course credit and badging are two ways to incentivize participation, the greatest barrier facing teachers engaging in OEP is firstly to locate the OER materials themselves and to be guided in a thriving OEP environment. In the section that follows, we turn to the PP, which serves as a transferable example and a systematic approach to building content-specific ancillary OER materials for a sustainable OEP community of practice[2] that spans institutional boundaries.

The Pathways Project in Response to Community Needs

The genesis of the PP began in 2014 in a language resource center (LRC) where undergraduate students participate in weekly conversation sessions lasting 30 minutes. These sessions are integrated into lower-division coursework and are designed to engage students in spontaneous conversation, an aspect of language learning that is often most challenging for teachers to facilitate[3]. Figure 2 provides descriptions of three sample activities.

Figure 2

Pathways Project Sample Ancillary Activity Descriptions

Spanish
"La subasta / The Auction"

This activity allows students to practice with the types of currency from Spanish speaking countries by purchasing items through an "auction." Students will practice using adjectives and numbers to describe the items they can sell or buy. They will also practice using persuasion to convince others to buy a product.

French
"Salutations et présentations / Greetings and Introductions"
(Junior High Version)

Students will practice introducing themselves, greeting someone, and answering how they are doing. They will also learn greetings for different times of the day. Students will understand the cultural importance of la bise, how this particular form of greeting differs in distinct areas of France.

Spanish
"El mundo del trabajo / The World Of Work"
(Online Activity)

In this activity, students will begin by discussing their preferred type of work environment and typical jobs held by college students. They will then discuss how they might handle a handful of difficult scenarios at work. Students will take turns being the employee and the advice giver.

Note. Activity links: La subasta/The Auction (https://www.oercommons.org/authoring/50436-spanish-level-1-activity-08-la-subasta-the-auction/view); Salutations et présentations/Greetings and Introductions (Junior High Version; https://www.oercommons.org/authoring/62339-french-level-1-activity-02-salutations-et-pr%C3%A9senta/view); and El mundo del trabajo/The World of Work (Online Activity; https://www.oercommons.org/courseware/lesson/74468). Images from https://pexels.com

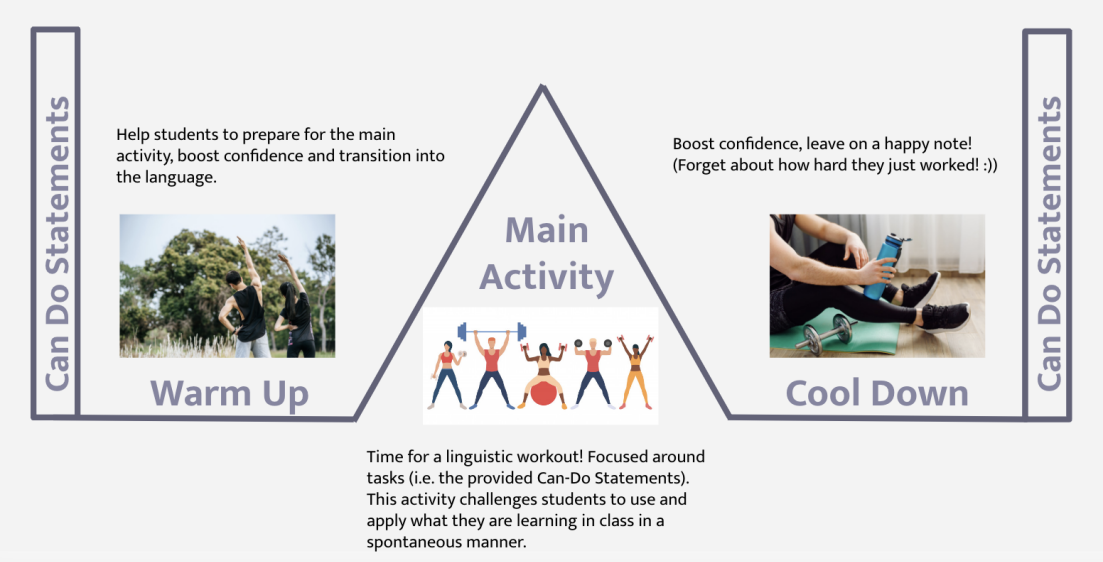
Most lower-division undergraduate courses have some overlap with K–12 content. This is especially the case for language learning whereby novice and intermediate level language courses may be represented at all institutional levels, K–16. Moreover, many of the content-specific pedagogical challenges we were observing in our own language department, for example, new standards, lack of resources, costly textbook adoptions, lack of time, and so forth, were similar to the challenges being voiced in the K–12 world-language communities in our region.

By 2018, we were observing consistent positive language learning gains and improved student engagement because of the LRC conversation activities in our language program. As a result, we launched the PP as an OER repository to support a broader community of teachers who wanted to help learners improve their ability to converse but were lacking the resources and/or pedagogical training to

do so. The activities that were originally created for our undergraduate LRC conversation sessions became the foundational PP activities that have been revised, remixed, and redistributed. As is shown in figures 3 and 4, each activity follows a similar scope and sequence adhering to best pedagogical practices, and provides a consistent template that facilitators can use.

Figure 3

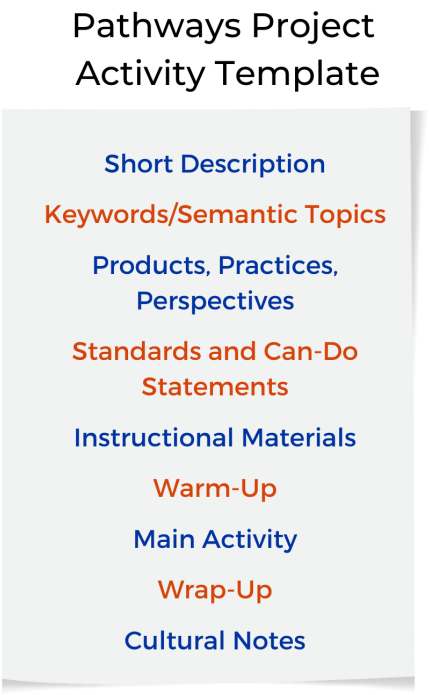
The Foundational Structure of Pathways Project Activities



Note. From Exercise icon [Photograph] by katemangostar by freepik.com. Images from https://pexels.com

Figure 4

The Scope and Sequence of Every Pathways Project Activity



Today, the PP hosts more than 800 face-to-face and online conversation activities for 10 world languages at the K–16 levels. Over 350 undergraduate students and teachers (K–12 and higher education) have been actively involved in materials creation, and the PP has a following of over 1,000 subscribers who receive monthly newsletters, attend webinars and workshops, and/or retain and reuse materials.

The PP aspires to continue supporting undergraduate learning within the higher education institution where it is housed while simultaneously augmenting and strengthening community engagement with K–12 teachers in both urban and rural school districts. The PP achieves these goals by focusing on growing/producing high quality, customizable teaching materials and providing accessible professional development in the discipline. The PP OER repository is categorized by subject and level and all materials are tagged with keywords to make them easier to find. Following a consistent template (Figure 4) across activities helps to reduce the time spent looking for an activity. Rather, users can focus their efforts on revising and remixing the activities through the embedded remix tool provided by OER Commons. Frequent professional development, in the form of tutorials, workshops, and webinars, develops and strengthens OEP teacher confidence to redistribute revised and remixed activities (i.e., renewable resources) for the larger PP community. These materials and professional development opportunities are constantly growing and improving, thanks to the PP team that brings together students, staff, and teachers, and is described in detail in the following section.

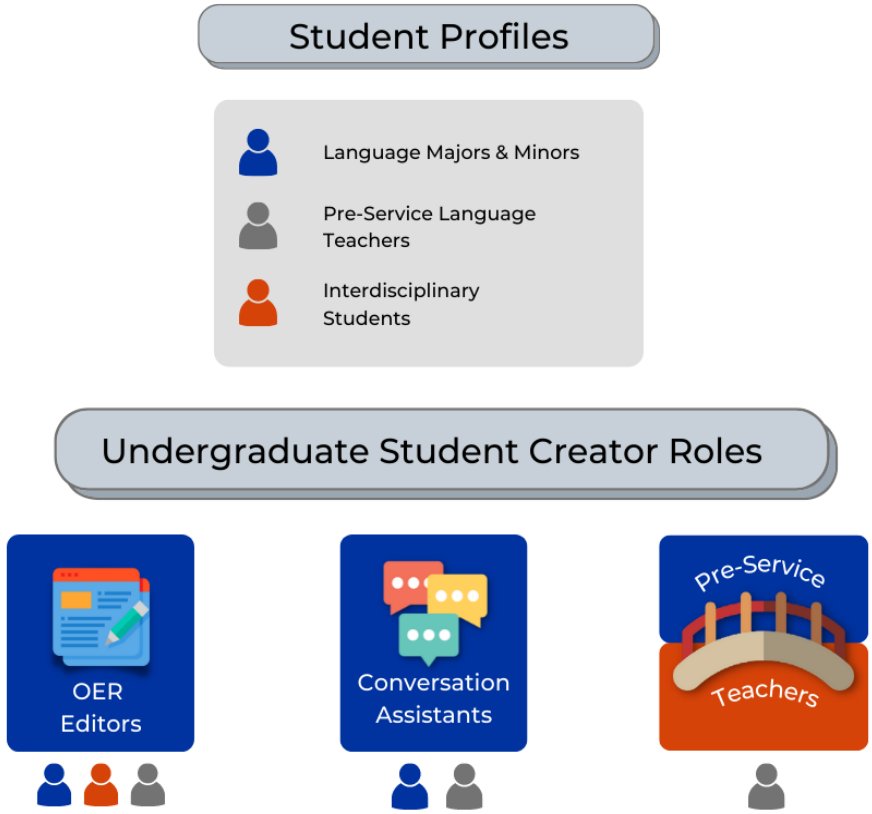
The Pathways Project Team: Roles and Responsibilities

Undergraduate students play a central role in the creation and dissemination of PP activities. One of the greatest benefits for undergraduate student involvement in OER and OEP is hands-on career-readiness and interdisciplinary collaboration. This is especially the case for academic programs in the

humanities where students can showcase their competencies in their major/minor by working on a project that directly impacts local communities. In the early stages of the PP, we recognized the importance of student involvement and identified distinct student profiles to assign different roles and responsibilities for ways students could help develop, refine, publish, and implement PP OER. As depicted in Figure 5, we created three distinct student creator roles to leverage students' academic experiences and interests: (a) OER editors, (b) conversation assistants, and (c) pre-service teachers. To sustainably recruit and retain undergraduate participation for these positions, we use two established pathways at the university: work study and internship for credit. In addition, we offer a limited number of paid hourly positions that we fund through a small fee attached to lower-division courses that have a conversation lab component.

Figure 5

Pathways Project Student Profiles and Roles



Note. Images from Chat icon by Vectors Market via freepik.com, Bridge icon by Free Pik via freepik.com, Notepad icon by itim201 via freepik.com

Conversation Assistants and OER Editors: Activity Developers

Activity development begins with conversation assistants who are content providers and stem from both language majors and minors and pre-service teachers. This group also includes native, heritage, and advanced speakers who are not presently language majors or minors. They use their knowledge of the target language and culture to develop ancillary materials and prepare a complete, highly customizable activity that contains a facilitation guide for instructors, a slide deck, and additional instructional

materials depending on the activity. Once created, conversation assistants facilitate the activities with small student conversation groups and report back to OER editors about any changes that may need to be made to enhance the instructional experience.

Students from all three profiles, as shown in Figure 5, may work as an OER editor. These students proofread and polish activities, test out multimedia materials, and ensure consistent instructional design. OER editors are responsible for openly licensing and publishing the activities designed by conversation assistants through OER Commons and Pressbooks. This team of students may also assist in-service teachers[4] wishing to publish materials they have created. In doing so, they help address barriers depicted in Figure 1 such as lack of time and skills, confidence in the quality of one's materials, and knowledge about copyright and licensing (Bates et al., 2007; Rolfe, 2012; Windle et al., 2010).

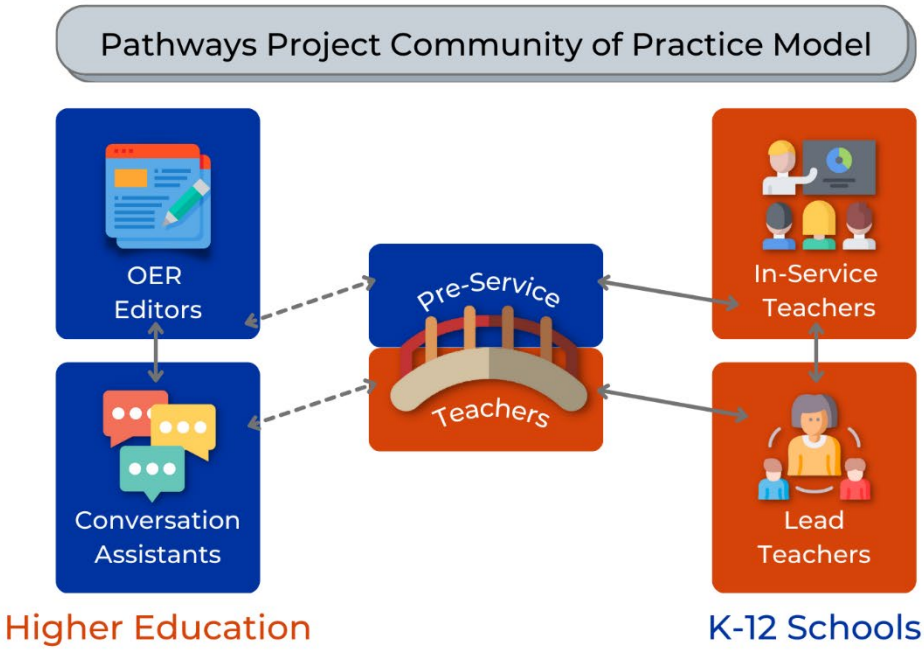
Pre-Service Teachers

Pre-service teachers are secondary education majors completing both language and teacher education courses and often work in all three creator roles, starting first as a conversation assistant or OER editor during their first and second years. In their third year, they take two methodology/pedagogy courses where the PP is integrated into course assignments. For example, the professor uses several PP OER ancillary activities as a model for facilitating standards-based practices to foster student engagement. In addition, students are taught how to retain, reuse, and revise the PP activities as formative exercises in both courses. This gives them opportunities to identify, select, and appraise how an activity might align with a typical K–12 curriculum. Finally, they complete a summative assessment where they design a unit plan that integrates a revised PP activity. Thus, by the end of their third year, all pre-service teachers have engaged in OEP and can employ their newfound competence to their field experiences.

Unique to this role, pre-service teachers dedicate most of their fourth and final year to their field experiences in local schools. Here they are encouraged to showcase PP activities to their in-service mentor teachers and to practice implementing their revised activities with students. This is an invaluable way both pre- and in-service teachers exchange expertise; pre-service teachers model to in-service teachers the process for locating and integrating PP activities in any given unit and in-service teachers provide expert knowledge on how to implement the activities in the classroom and evaluate the efficacy of the PP activities in practice. Thus, undergraduate students play a vital role in bridging OEP opportunities between higher education and K–12 institutions by generating PP OER activities that are then customized by teachers for local purposes. Figure 6 shows the different members of the PP team who support the OEP community of practice.

Figure 6

The Pathways Project Community of Practice: Bridging Institutional Boundaries With OER



Note. Images from Chat icon by Vectors Market via freepik.com, Bridge icon by Free Pik via freepik.com, Notepad icon by itim201 via freepik.com, Teach icon by Nikita Golubev via freepik.com, and Communication icon by Free pik via freepik.com

Equitable Opportunities for OEP Professional Development

One of the greatest challenges when engaging in OEP across institutional boundaries is to find an approach that is sustainable and equitable. There are many disciplines in higher education that have teacher education programs. One of the defining features of these programs is that pre-service teachers are mentored by in-service teachers through field experiences in secondary schools over several semesters towards the end of the program. However, the number of pre- and in-service teachers is relatively small, especially for world languages. Thus, it was imperative to operationalize a parallel approach to grow awareness and engagement with the PP that was accessible to all teachers in the community and beyond.

Since 2019, the PP has pursued three fundamental approaches to engage a broader network of in-service world-language teachers in the OEP process. First, the PP team has presented the PP activities at local, state, and national conferences in person and online to heighten awareness of the PP and OEP in general. Second, one of the PP directors has facilitated year-long professional development workshops with several local school districts. At these workshops, teachers are introduced to the PP activities as examples of best pedagogical practices and taught how to retain, reuse, and revise PP activities to align with their curriculum. Workshop time is provided for teachers to practice what they've learned by customizing PP activities for an upcoming unit. Finally, the PP has pursued local, state, and national grant funding to further support professional development opportunities for K–16 world-language teachers. Local and state funding has supported two iterations of semester-long intensive training and

mentorship with a small group of K–16 teachers who work with the PP team to revise PP activities. In 2022, the PP received a two-year Digital Humanities Advancement Grant from the National Endowment for the Humanities to further these objectives with a larger group of teachers and to expand beyond retain, reuse, and revise to also integrate the remix and redistribute cycles of OEP. Grant deliverables include a PP Hub (https://pathwaysproject.my.canva.site/), which provides support for teachers as they engage in the 5Rs mentioned above. In addition, the funding will support much needed research that evaluates rural and urban K–12 OEP teacher practices in the humanities.

Together, these three approaches have enabled the PP team to bridge institutional boundaries by helping undergraduate students and faculty and staff strategically work with the K–12 community to produce a growing repository of renewable materials. Most importantly, the OEP process provides critical discipline-specific teacher development that fosters learning by doing.

A Call to Action: Steps to Consider for OEP Teacher Engagement

The PP OER has sustainably and effectively grown in quantity, quality, and impact over the last four years. This is in large part due to the PP team design that, like the cogs in a wheel, empowers each entity of the team to effectively build off and work with one another. The aim of this paper is to outline key elements (people and structures) that may exist across disciplines in higher education and, specifically, for programs that support pre-service and in-service teacher development in some capacity. Table 1 provides practical steps an institution can take to also meet this aim. These steps specifically address OER ancillary materials creation, not a textbook. Nonetheless, regardless of the product, ancillary or textbook materials, these guidelines might help other institutions brainstorm ways to do this type of OEP collaboration.

Table 1

Practical Steps to Foster a K–16 OEP Partnership

1. Work with content experts and teacher educators to co-create a working template for face-to-face, hybrid, or online activities that align to standards to ensure a consistent instructional experience based on best teaching practices.
2. Identify pre-service teachers early in the process and strategically integrate them into the materials creation process. If a lab exists in your program, use the lab as a playground to pilot implementation of activities and generate feedback early on. If a lab does not exist, teaching assistants can help facilitate these activities in class with the support of faculty.
3. Work with faculty to recruit a wide range of students with diverse backgrounds and majors but also a vested interest in the content/discipline.
4. Strategically build collaborative teams of undergraduate students through work study, internships, or paid positions where they can apply their interests and experiences in meaningful ways (i.e., materials creation, OER editing, graphic design, etc.).
5. Mentor pre-service teachers as early OER ambassadors by systematically integrating OER and OEP curricula into their coursework.
6. Work with the teacher education program to integrate and evaluate OER activities in-action by implementing them in field experiences.

7. Invite mentor teachers to provide constructive feedback on OER materials that is then operationalized by the OER team at the institution.
8. Support mentor teachers to engage in the OEP process with their pre-service teacher or through professional development opportunities at the local levels or through online, on-demand training.
9. Open opportunities for informal engagement whereby teachers not directly tied to a host institution can also engage in this process and receive badging and professional development credit to honor and make visible their contributions and skill development.
10. Support teachers through professional letters to administrators that articulate this engagement and contextualize the importance of badges and credit as evidence of their participation and OEP development.

Innovative Solutions to Address Barriers

The steps above have come from the invaluable lessons the PP team has learned and refined along the way, and yet teachers at all levels face many barriers (see Figure 1) that inhibit the transformational pedagogical experience that OEP touts (Baas et al., 2019). Recognizing and explicitly addressing these barriers is paramount. Firstly, teachers must possess or cultivate information literacy skills when searching for and ultimately selecting materials related to their discipline (Tang & Bao, 2020). This process can be time intensive and frustrating at best. While teachers of introductory level courses may find a virtual treasure trove of materials, intermediate and less commonly taught subjects (or in our case, languages) are lacking materials. Even when materials are plentiful, time is needed to review and appraise them. Once a teacher selects an OER material they'd like to reuse, a new, specific set of skills is required to revise and remix. Here again, time functions as a barrier, along with lack of reward, lack of confidence in one's materials, and a lack of skills (Bates et al., 2007; Wenk, 2010; Windle et al., 2010). Teachers who successfully revise and remix materials may share their materials with their local network, but "seem to refrain from sharing on the Web" (Van Acker et al., 2014, p. 142), owing to what Beaven (2018) called dark reuse. Most concerning, however, is the urban-rural K–12 divide where OEP might make the greatest impact. Teachers in urban districts have greater access to professional development workshops to address and overcome these barriers while teachers in rural school districts do not (Tomlinson, 2020). Virtual workshops and strategic outreach that is inclusive of rural professional development can address these disparities, and this is the primary objective for the PP moving forward.

Conclusion

While not an exhaustive list, the contents of Table 1 delineate best practices that have contributed to the sustainability of the PP over the last four years. In addition, items nine and ten point to future-focused initiatives the PP has recently developed that can support open distributed learning contexts for teachers. Nonetheless, the barriers discussed are clear growth opportunities where the PP can address long-standing challenges in OEP. Moving forward, one of our present challenges is how to foster long-term OEP sustainability with in-service teachers who do not mentor pre-service teachers and attend professional development workshops because their districts mandate them. A common misconception for these teachers is that OER materials are finalized products that must fit exactly within their unit or curriculum to serve an immediate purpose. Professional development workshops can be important

stepping stones to adjust these misconceptions by emphasising the process of OEP and the investment of time it will take to customize materials to better align them to the curriculum and, most importantly, for their students. Furthermore, the PP is eager to engage with teachers across state lines and measure OEP outcomes to better understand informal learning contexts in an Online Distributed Learning context. Finally, the PP has experienced challenges well documented in the OER literature with regards to the lack of redistribution or sharing back (Beaven, 2018). This is a particularly complex challenge for K–12 community outreach that is in stark contrast to most university courses that, by nature, are taught by people who have more control and can strongly encourage students to make their assignments renewable through redistribution or sharing back. As the PP engages in its next cycles of K–12 community outreach, it will be imperative to better understand and evaluate mitigation strategies to foster increased redistribution amongst K–12 teachers, including fostering digital literacy skill development in both rural and urban settings, so that PP is representative of diverse learning environments to positively impact student learning for all.

References

Allan, S. (2021). *Four ways K–12 and higher education can collaborate on pandemic recovery*. The Bill and Melinda Gates Foundation. https://usprogram.gatesfoundation.org/news-and-insights/articles/four-ways-k12-and-higher-education-can-collaborate-on-pandemic-recovery

Baas, M., Admiraal, W., & van den Berg, E. (2019). Teachers' adoption of open educational resources in higher education. *Journal of Interactive Media in Education*, *1*(9), 1–11. https://doi.org/10.5334/jime.510

Bates, M., Loddington, S., Manuel, S., & Oppenheim, C. (2007). Attitudes to the rights and rewards for author contributions to repositories for teaching and learning. *Alt-J, Research in Learning Technology*, *15*(1), 67–82. https://doi.org/10.1080/09687760600837066

Beaven, T. (2018). "Dark reuse": An empirical study of teachers' OER engagement. *Open Praxis, 10*(4), 377–391. https://doi.org/10.5944/openpraxis.10.4.889

Blomgren, C. (2018). OER awareness and use: The affinity between higher education and K–12. *The International Review of Research in Open and Distributed Learning*, *19*(2). https://doi.org/10.19173/irrodl.v19i2.3431

Blomgren, C., & McPherson, I. (2018). Scoping the nascent: An analysis of K–12 OER research 2012–2017. *Open Praxis*, *10*(4), 359–375. https://doi.org/10.5944/openpraxis.10.4.905

Gimbel, E. (2018, May 16). Higher education and K–12 form partnerships to help educators and learners. *EdTech: Focus on K-12*. https://edtechmagazine.com/k12/article/2018/05/higher-education-and-k-12-form-partnerships-help-educators-and-learners

McGreal, R., Mackintosh, W., Cox, G., & Olcott, Jr., D. (2022). Bridging the gap: Micro-credentials for development: UNESCO Chairs policy brief form—Under the III World Higher Education Conference (WHEC 2021) Type: Collective X. *The International Review of Research in Open and Distributed Learning*, *23*(3), 288–302. https://doi.org/10.19173/irrodl.v23i3.6696

Parker, K. (2019, August 19). *The growing partisan divide in views of higher education*. Pew Research Center. https://www.pewresearch.org/social-trends/2019/08/19/the-growing-partisan-divide-in-views-of-higher-education-2/

Rolfe, V. (2012). Open educational resources: Staff attitudes and awareness. *Research in Learning Technology*, *20*(1), 1–13. https://doi.org/10.3402/rlt.v20i0.14395

Seaman, J. E., & Seaman, J. (2022). *Coming back together: Educational resources in U.S. K–12 education, 2022*. Bay View Analytics. https://www.bayviewanalytics.com/reports/k-12_oer_comingbacktogether.pdf

Tang, H., & Bao, Y. (2020). Social justice and K–12 teachers' effective use of OER: A cross-cultural comparison by nations. *Journal of Interactive Media in Education*, *1*(9), 1–13. https://doi.org/10.5334/jime.576

Tomlinson, H. B. (2020, September). Gaining ground on equity for rural schools and communities.

MAEC Rural Equity Series. https://maec.org/wp-content/uploads/2020/09/MAEC-Rural-Gaining-Ground.pdf

Van Acker, F., Vermeulen, M., Kreijns, K., Lutgerink, J., & Van Buuren, H. (2014). The role of knowledge sharing self-efficacy in sharing open educational resources. *Computers in Human Behavior*, *39*, 136–144. https://doi.org/10.1016/j.chb.2014.07.006

Van Allen, J., & Katz, S. (2019). Developing open practices in teacher education: An example of integrating OER and developing renewable assignments. *Open Praxis*, *11*(3), 311–319. https://doi.org/10.5944/openpraxis.11.3.972

Van Allen, J., & Katz, S. (2020). Teaching with OER during pandemics and beyond. *Journal for Multicultural Education*, (*14*)3/4, 209–218. https://doi.org/10.1108/JME-04-2020-0027

Vygotsky, L. S. (1978). *Mind in society: The development of higher psychological processes*. Harvard University Press.

Wenk, B. (2010, April). Open educational resources (OER) inspire teaching and learning. In *IEEE Educon 2010 Conference* (pp. 435–442). IEEE. https://doi.org/10.1109/EDUCON.2010.5492545

Wiley, D., Webb, A., Weston, S., & Tonks, D. (2017). A preliminary exploration of the relationships between student-created OER, sustainability, and students' success. *The International Review of Research in Open and Distributed Learning*, *18*(4). https://doi.org/10.19173/irrodl.v18i4.3022

Windle, R. J., Wharrad, H., McCormick, D., Laverty, H., & Taylor, M. G. (2010). Sharing and reuse in OER: Experiences gained from open reusable learning objects in health. *Journal of Interactive Media in Education*, *2010*(1), Article 4. http://doi.org/10.5334/2010-4

Wolfenden, F. & Adinolfi, L. (2019) An exploration of agency in the localisation of open educational resources for teacher development. *Learning, Media and Technology*, *44*(3), 327–344. https://doi.org/10.1080/17439884.2019.1628046

Athabasca University

[1] The authors refer to the K-16 bridge as an opportunity for primary, secondary, and tertiary institutions to work together to improve teaching and learning through OEP. In many contexts, institutions of higher education struggle to meaningful engage with primary and secondary teachers and in many disciplines there are content overlaps that can be addressed, collaboratively, with OEP at the nexus.

[2] A community of practice is a sociocultural construct whereby human development is rooted in social, historical, cultural interaction mediated by signs, tools, and artifacts like OER (Vygotsky, 1978).

[3] Traditional language teaching has been heavily influenced by grammar translation methodology. Although most teachers agree that communicative language teaching is an important goal, this isn't always easy to do in practice.

[4] In order to support in-service teachers wanting to redistribute their PP OER materials, OER editors can provide one-to-one asynchronous assistance via e-mail.

International **R**eview of **R**esearch in **O**pen and **D**istributed **L**earning
Volume 24, Number 2

May – 2023

Critical Issues in Open and Distance Education Research

Junhong Xiao
The Open University of Shantou / Shantou Radio & Television University, Shantou, P. R. China

Abstract

Despite its mainstreaming into the broader educational ecology, open and distance education (ODE) still leaves much to be desired in terms of both practice and research. Inspired and informed by the author's 35 years of experience as an ODE practitioner, researcher, reviewer, and editor, this article concentrates on 10 critical issues of ODE research that have long existed but may have a consequential impact on its healthy growth. The issues discussed cover scarcity of longitudinal research, paucity of scaling-up and generalization research, preference for success over failure presented in research, the need for a systems approach, lack of sociocultural sensitivity, technologization of research, scant attention to ODE for the underprivileged and disadvantaged, insufficient research on ODE policy, negligence of historical research, and disinterest in revisiting ODE theories. The causes of these problems are critically interpreted and their possible negative impacts on the field of ODE are explored in a concise manner. The purpose of this article is to encourage further discussion and debate on ODE research to sustain its presence and acceptance as a legitimate mode of education in the wider educational community.

Keywords: open and distance education, issues of concern, research, sustainable development

Introduction

Open and distance education (ODE) is a burgeoning area of research, with the number of publications on the rise in the past decades. Take journal publications as an example. *The International Review of Research in Open and Distance/Distributed Learning* (*IRRODL*) contained only 6 research articles in its first year (2000) and 16 research articles and 4 notes in 2001. However, the number has been increasing ever since, with 40 research articles, 7 literature reviews, and 4 notes published in 2021. This growing trend was echoed in the publications of *Distance Education*, rising from 17 original articles published in its first year (1980) to 30 original articles and 1 reflection in 2021. The same phenomenon was observed in the publications of five ODE journals from 2009 to 2016 (Çakiroğlu et al., 2019). A study of ODE journal publications by authors from South Africa also confirmed this trend, with the number increasing from 142 articles between 2010 and 2014 to 316 in the subsequent five years (2015–2019) (Roberts & van der Walt, 2021).

Despite its increasing popularity, especially since the emergence of extended massive open online courses a decade ago, it was the COVID-19 pandemic that put ODE in the spotlight, almost overnight, turning it into the only option for the entire education sector, including institutions that previously cast doubt on it. ODE continues to gain momentum and is sure to remain post–COVID-19. No longer can dedicated ODE institutions claim ODE to be their prerogative. Never before has it been so imperative, against a backdrop featuring diversity in all senses, to inform ODE practice with meaningful, rigorous, and trustworthy research.

Nevertheless, despite abundance in quantity and a substantial body of solid research, ODE research is often criticized for, among other things, lacking methodological rigor (Panda, 1992; Simonson et al., 2011), being under-theorized (Perraton, 2000; Saba, 2000; Ukwoma & Ngulube, 2021), and focusing on isolated studies (Bulfin et al., 2013; Fryer et al., 2023). Inspired and informed by my experience as an ODE practitioner, researcher, reviewer, and editor for 35 years, I intend to focus on the following 10 issues deriving from ODE research: longitudinal research, scaling-up and generalization, success and failure, a systems approach, sociocultural sensitivity, technologization of research, ODE for the underprivileged and disadvantaged, ODE policy, historical research, and revisiting of ODE theories. The purpose of this article is to call on ODE researchers to solve "significant problems" (Reeves & Lin, 2020, p. 1999) and hopefully spark discussions and debates on issues meriting our concern.

Critical Issues of Concern

Longitudinal Research

ODE research tends to be predominantly characterized by one-off studies of short duration (Fryer et al., 2023). For example, a review of 238 empirical studies published in 2021 in eight ODE journals listed in the Social Sciences Citation Index and the Emerging Sources Citation Index (Peng & Xiao, 2022) shows that about 80% (n = 189) of the studies were cross-sectional in nature, with some studies whose intervention or treatment was only about one hour long (e.g., Arnò et al., 2021; Juarez & Critchfield, 2021) or even as short as eight minutes (Stadler et al., 2021). We are in dire need of research such as that by Dempsey et al. (2021), who conducted a study using three experiments to explore factors affecting interactive television (ITV) course satisfaction. The first experiment engaged 954 students from six instructors over five years, involving 36 face-to-face courses and 34 ITV courses, aiming to

collect end-of-course evaluation data. The second experiment was intended to collect in-the-moment feedback right after a class meeting over a single semester. The third experiment, which lasted one week, was intended to investigate whether there was any difference between the students' experience in attending ITV courses with the instructor present in the same classroom and those with an instructor at a different location.

Bond et al. (2021) reports a higher percentage (92.9%) of cross-sectional studies on emergency remote teaching in higher education. Isolated studies also make up a long-existing trend in the field of educational technology (Reeves & Lin, 2020) as well as other related areas of scholarship, for example, regarding e-portfolios (Scully et al., 2018), mobile learning (Song & Xiao, 2017), and learning analytics (Viberg et al., 2020). Findings from one-off, short-duration studies may be applicable to a particular event or intervention but are unlikely to be generalized to a wider scale and may also be biased. The effectiveness of an educational intervention needs to be tested over time. Instant effectiveness may be no more than an illusion. What is seen or experienced at the beginning of an intervention may be radically different from the reality if the intervention continues long enough, involving different learners and instructors in different learning environments and with different learning objectives and domains of knowledge (Selwyn, 2012). To ensure the validity and reliability of research outcomes, we need more longitudinal research to turn studies into iterative processes.

The effectiveness of an educational intervention takes time to become robust; only those interventions that survive the tests of both time and practice are worthwhile. A new direction of research suggested by Reeves and Lin (2020) also applies to the field of ODE,

> whereby we develop robust, multi-year research agendas focused on important problems and innovative solutions, judge our worthiness for promotion and tenure on evidence of impact rather than simple article counts, closely collaborate with practitioners, and establish our field as preeminent in meeting global problems related to education. (p. 1999)

Scaling-Up and Generalization

Echoing the call for longitudinal, iterative research is the issue of scaling-up and generalization. Moore (2008) aptly observes that "too much energy is wasted on research that produces ungeneralizable findings because they focus only on the analysis of specific programs within specific institutions" (p. 67), a finding echoed by Tynan et al. (2023). This is because much of the research in ODE is on a pilot stage or a very small scale in an idealized environment. Many factors of distraction are under control or not taken into (full) account. And because of the short duration, all participants concerned are still on their honeymoon with the experiments conducted, experiencing a sense of euphoria and seeing only the positive side. The seeming effectiveness also may not represent the actual effect and cannot be generalized to a wider variety of contexts. Therefore, scaling up research and generalizing research results to other contexts should be on the research agenda. People often complain about the glaring gap between research and practice or policy making. Whether this gap can be bridged depends to a great extent on whether research results can be generalized. Although no one questions the importance of practice or decision-making being informed by research, misinformation will ensue unless the research results are fit for the purpose or context. Practitioners or policy makers should not be blamed for not applying research results. If research results are conducive to practice, the temptation to draw on research will overcome resistance to changes.

Replication and extension research should also be encouraged (Dennis & Valacich, 2015) in the efforts to scale up research and generalize outcomes. It is astonishing that there was only one replication study that aimed to further test the "blended learners' online component challenges" scale previously developed by the authors and assess its validity and reliability, among other things (Bayyat et al., 2021), and 12 extension studies (building on the findings of an earlier study in an attempt to refine, enrich, and/or expand its findings) among the 238 empirical studies reviewed in Peng and Xiao's (2022) study. For example, Stadler et al. (2021) set out to enrich the control procedures of online examinations proposed by Cluskey et al. (2011) by conducting an experiment involving three different inventions of time pressure in online examinations, while Honig and Salmon (2021) attempted to add a fourth presence—learner presence—to the Community of Inquiry framework.

Sociocultural Sensitivity

Education is culturally constrained; technology is culturally loaded. Neither is culturally neutral. Traxler and Crompton (2015) challenge the popular assumption that the practices and principles of mobile learning can be automatically transferred from one culture to another. Therefore, "academics should maintain an interest in, and sensitivity towards, the importance of local contexts, cultures and circumstances" (Selwyn, 2012, p. 216; also see Tynan et al., 2023).

ODE research should be socioculturally specific, an argument advocated by researchers from both Western and non-Western backgrounds. Dominant ODE theories tend to be derived from the Western world (Gaskell, 2017; Jung, 2019c) and may not always suit other sociocultural contexts in which they are used to inform local practice (Gaskell & Mills, 2017). Jung (2019a) states, "We need to bring educational philosophies and ODE traditions from previously unexplored regions into the refinement and reinterpretation of ODE theories" (p. 120), elaborating and further developing extant ODE theories so that they are equally applicable to new contexts. In the light of this imperative, Jung (2020) proposes the contextualization–generalization–recontextualization cycle for ODE theory building and application.

Certain features of ODE are universal across different sociocultural contexts. However, other aspects of ODE may vary from one socioculture to another. Research into these differences will surely strengthen the explanatory and guiding power of ODE theories so that research results can effectively inform practice in a wider variety of sociocultural contexts. This line of inquiry can be deemed as a kind of generalization effort. Currently, the sociocultural dimension of ODE research remains less well researched than it deserves to be (Kimmons, 2020).

Success and Failure

Longitudinal research, including scaling-up and generalization, can never be completely free from failure. Nonetheless, very few studies, if any, report on the failure of an intervention. In his reflections on the 2017 World Conference on Online Learning held in Toronto, Prinsloo (2018) observes the absence of reports and presentations on failures, asking whether we could talk about failures. According to him, only success is worth reporting and circulating while failure is useless or a shame to admit even among fellow researchers. This is an unwritten rule not only seemingly conformed to by gatekeepers and researchers but also matching other stakeholders' expectations (Kram & Dinsmore, 2014). Pursuing "best practice" or what works is the ultimate goal of research (Bulfin et al., 2013; Reeves & Lin, 2020). Nevertheless, "best practice" is often built on both success and failure rather than success only.

Ignoring failures violates a basic law of nature. Metaphorically speaking, research is like a game of Snakes and Ladders. Telling other researchers what snakes you have come across can help them avoid being bitten. Innovations or advancements are always accompanied by success and failure alike. Ignoring a failure will likely lead to repeating the failure or end in more failures rather than contributing to success. In fact, there is as much to learn from failure as from success. This is the rationale behind the instructional design of productive failure (Kapur, 2008). The concept of productive failure can be equally applicable to research. Given that an intervention is usually carefully designed in advance, aiming for good results, the rate of success tends to be much higher than that of failure. However, it is unusual to always have success but never failure. If we favor success over failure, or even choose to ignore failure, we simply refuse to accept that research "is as much about investigating the imperfect 'state of the actual' as it is about exploring the perfected 'state-of-the-art'" (Selwyn, 2012, p. 216). In addition to communicating inaccurate research results, we are also distorting the ecology of research, which will have a lasting harmful impact on the development of ODE.

A Systems Approach

A systems approach to ODE is essential to ensuring a generation of meaningful research results. The systems approach to ODE was first tested in Wedemeyer's Articulated Instructional Media project in the 1960s (Moore & Kearsley, 2012) and further developed and elaborated by Moore in his distance education theory (Moore, 1972). Distance education is "a system consisting of three sub-systems: a learner, a teacher, and a method of communication" (Moore, 1973, p. 663). This is a narrow-sense systems approach emphasizing the interplay between the three micro-level variables in teaching (Xiao, 2023b). Later, Moore expounded a broad-sense systems approach (Moore & Kearsley, 1996), which was further refined into the systems model of distance education (Moore & Kearsley, 2012). The systems approach has been adopted and practiced in the construction of open universities all around the world. However, it should be borne in mind that this approach is not just instrumental in practice but conducive to research as well (Xiao, 2023b). Unfortunately, it is seldom used in ODE research.

For example, despite the complexity and dynamics of student success due to the interplay between factors at micro-, meso-, and macro-levels, research overwhelmingly tends to study select individual variables, hence often mixing up correlation and causation (Prinsloo et al., 2020). Causation is much more complex than correlation and can only be defined through a systems lens in most cases. Mistaking correlation for causation may lead to false effectiveness of an educational intervention or wrong diagnosis of causes of failure. The socio-critical model of student success proposed by Subotzky and Prinsloo (2011) is a good example of a systems approach to ODE research.

Focus on select individual factors seems to be a common feature of ODE research. For example, technological determinism or Silicon Valley solutionism is basically a reductionist approach to education, naively taking technology or algorithm as the panacea for all educational problems. However, access does not necessarily translate into success, which is affected by many other factors (Gaskell & Mills, 2017). A systems approach to ODE research may set higher demands on researchers, involve more resources, and take longer to produce outcomes but will definitely generate more robust and consequential findings. As mentioned above, the COVID-19 pandemic has greatly accelerated the mainstreaming of ODE. Nevertheless, given that there has been no systems thinking to speak of in the emergency remote teaching during the pandemic (Bozkurt et al., 2020), a systems approach to ODE research cannot be overemphasized today.

Technologization of Research

Technological determinism is nothing new; a frequent criticism is that education is a very complex process and technology can never be a panacea for all educational problems (Prinsloo et al., 2020). Similarly, technological determinism has permeated ODE research and seems to be a fashionable trend. Nowadays, more and more research relies on the use of sophisticated software as research instruments for data mining or collection and analysis. Findings appear dehumanized and, hence, seemingly scientific and unbiased. However, education is an inherently human enterprise (Xiao, 2021). It can never be dehumanized, and neither can its research. Software can help researchers do a better job than manual work by, say, harvesting massive data and identifying patterns much more effectively and perhaps more accurately. However, it needs human input to interpret the meanings behind the statistics. Statistics can tell what happens but are less likely to explain how and why it happens. They may indicate a correlation between two variables but not causation, which is where human interpretation is needed, in particular, through a systems lens.

For example, it is often assumed that the more interactive a learner is, the more messages one posts, the better the learning achievement. Interactivity in this sense can be easily determined with the help of software; however, whether it affects achievement is far more complicated than software can tell. First, distance learning involves three types of interaction: learner–content, learner–instructor, and learner–learner (Moore, 1989). Learner–learner interaction alone cannot represent the entire interaction process. Second, whether learner–learner interaction impacts on learning outcomes depends not only on the quantity but also on the quality of interaction. Surely, interaction must happen, and considerably, before it is likely to have an effect on learning. However, the content of an interaction matters more. If the interaction is irrelevant to the course objectives or purely phatic communication, how can we establish the causation between interactivity and learning progress? Even if it is relevant to the course objectives, we must also account for the contributions of learner–content interaction and learner–instructor interaction to learning achievement, among other factors. We cannot possibly attribute learning progress to one factor only, in this case, learner–learner interaction.

Commenting on the dehumanization approach to education practice, Bates (2016) criticizes computer scientists for being too proud of themselves and believing they can solve any problem with computer technology without knowing anything about the problem itself. When it comes to ODE research, some researchers take the power of software for granted but have yet to develop insights into ODE practice. Such insights are essential to aptly interpreting software analysis results. Technology can replace neither human teachers nor human researchers; it can only play the role of a tool, not an agent.

ODE for the Underprivileged and Disadvantaged

Similarly, we should guard against the tendency to favor the technologization of ODE at the sacrifice of less technologized forms of ODE. Given the core values of ODE such as equity in education, social justice, knowledge sharing, democratization of education, and accessibility, Bozkurt (2019) rightly argues that despite all the exciting changes in ODE, we should not forget that “realities such as [the] information gap and the digital divide are still very alive and, therefore, it is important to keep the back door open” for those who are underprivileged (p. 510). These realities have been even more conspicuous during the COVID-19 pandemic (Bozkurt et al., 2020) and in developing countries (Jha & Ghatak, 2023).

Technology-supported ODE may not benefit all in that ODE needs to cater to those whom it is supposed to serve in the first place. The increasing use of cutting-edge technologies in ODE may even re-marginalize the underprivileged rather than realize the core values of ODE (Gaskell & Mills, 2017). A typical case in point is massive open online courses (MOOCs). Despite the hype around democratizing higher education, the actual beneficiaries of MOOCs are mostly well-educated individuals with university degrees from relatively better-developed regions of the world rather than those who are in desperate need of higher education opportunities (Christensen et al., 2013; Fernandez-Dıaz et al., 2020). A review of publications in seven peer-reviewed ODE journals from 2009 to 2013 also shows that the underprivileged and disadvantaged population seldom constitutes the research subjects (Bozkurt et al., 2015). More research in ODE for underprivileged cohorts is needed post–COVID-19 (Hao & Xiao, 2021).

ODE Policy

According to Diehl (2018), "any distance education system depends upon policies, management, and an administration to provide the guidelines and leadership that are required for success" (p. 321). Across the world, ODE is deeply influenced by government and institutional policies, which play a key role in shaping the ODE landscape. A pertinent case in point is the pivot to online learning during COVID-19.

However, research into ODE policy is limited. For example, a search in August 2022 for articles with *policy* in their titles from publications in *Distance Education* (1980–2022) returned nine hits. Another search with *policy* as the keyword returned six hits, but three of them also had the word in their titles. This scarcity is reinforced by a review of publications in the first 35 years of the journal, according to which *policy* as a concept appears only once in the concept map for the time period between 1980 and 1984 but does not form a thematic region of its own (Zawacki-Richter & Naidu, 2016). The case is the same for *IRRODL*, according to Zawacki-Richter et al. (2017) and other wider-scale reviews of ODE publications (e.g., Bozkurt et al., 2015; Bozkurt & Zawacki-Richter, 2021; Çakiroğlu et al., 2019). The dearth of policy research is further evidenced in the *Handbook of Distance Education* (Moore & Diehl, 2018) and *Online Distance Education: Towards a Research Agenda* (Zawacki-Richter & Anderson, 2014). The former consists of four parts, with the third part dedicated to management, policy, and administration but including only one chapter focusing on policy (Davis, 2018). The latter does not have a chapter with an exclusive focus on ODE policy (although Paul's [2014] chapter has a section on educational policy), despite the frequent appearance of the word *policy* across the volume.

Reviews of publications in relation to technology-supported education also come to the same conclusion: that policy is an under-researched theme (e.g., Bond et al., 2019; Zawacki-Richter & Latchem, 2018). Given the role that policies play in shaping the development of ODE, policy-focused research cannot be overemphasized, especially when ODE has been integrated into campus-based education in various forms.

Historical Research

In the same vein, historical research is seriously understudied in the ODE literature, also not forming a thematic region of its own in the above-mentioned literature reviews. Fifteen years ago, Moore (2008) pointed out that "very few articles of a historical nature have been published in the past twenty years in any of the main journals" (p. 68), warning that there will be a price to pay if we ignore distance education history. Moore explains the paucity of research on ODE history from three aspects. First, historical

knowledge is considered "of only marginal importance," hence giving place to the mastery and application of "currently fashionable technologies" (Moore, 2008, p. 68). Second, people are not familiar with the methodology of historical research. Third, the dominance of technological determinism leads to the neglect of "the amazingly rich trove of unanswered questions as well as the resources that wait for anyone who gets involved in historical research" (Moore, 2008, p. 69). Moore's first and third arguments are echoed by Selwyn (2012), who asserts that "the mere thought of digital technology compels many people to look forward rather than back, … anticipating what is about to happen with technology rather than attempting to make sense of what has already happened" (p. 216). Selwyn (2012) thus suggests that research and writing maintain "a sense of history" (p. 214).

There is so much to be learned from ODE policy makers, institutions, researchers, and practitioners about its history (Xiao, 2023a). Unfortunately, historical research has yet to attract due attention from the ODE community. Baggaley (2014, 2017) laments the fact that we continue to make the same mistakes and waste time researching the same "old" questions raised in previous studies as a result of our ignorance of erstwhile ODE research, a point echoed by Mishra et al. (2021). For example, MOOCs have renewed interest in researching educational videos. Nevertheless, researchers often ask questions that were studied in depth by education television researchers in the 1960s through the 1980s (Baggaley, 2017). Another typical case in point is research regarding flipped learning, which is actually the norm of dedicated ODE institutions around the world but is heralded as an innovative pedagogy, hence a hot research topic. Fewer studies, however, are appealing to researchers and practitioners from ODE institutions. Similar issues exist in online and blended learning in general. This situation needs rectifying now. At no time in the history of education has lack of knowledge about the history of ODE been as costly as it is now as a consequence of the increasing use of cutting-edge technologies and also of the mainstreaming of ODE into campus-based universities (Moore, 2014).

Revisiting ODE Theories

The importance of theory to practice is self-evident. Whoever denies this is doomed to act like a blind man feeling an elephant, merely relying on one's own imagination and perception to make decisions on practice. Jung (2019b) makes a case for updating and developing ODE theories in the digital age, saying that "there is a pressing need to revisit the time-honored theories developed in the era of correspondence education and traditional distance education" (p. 4).

With so many changes taking place in so many aspects of ODE over time, we certainly need to examine how well existing ODE theories cater to the changing landscape of ODE and, more importantly, where they need to be updated, revised, and further developed to better inform emerging practice. For example, research specific to a socioculture, as mentioned above, can be deemed as an effort to revisit existing ODE theories. The emergence of newer theories for digital learning spaces (Downes, 2023) can also be taken as the result of revisiting "old" ODE theories (also see Anderson, 2016); some examples of "old" theories include Wedemeyer's (1981) theory of independent study, Peters's (1973) industrialization theory, Moore's (1972, 1983, 1993) theory of transactional distance, and Holmberg's (1983) theory of guided didactic conversation.

ODE research must be underpinned by sound theories but should also aim to improve established theories. Only in this way can we ensure sustainable development of both ODE as a field of practice and of scholarship. As ODE is catering to increasingly diverse learners, finding favor in a wider range of

contexts, and involving stakeholders from various sectors, the need to evolve existing theories is unquestionable.

Concluding Remarks

ODE has been mainstreamed into the broader ecology of education (Xiao, 2018). Nevertheless, more research efforts are needed, given that ODE has now entered a broader field of practice, involving a greater diversity and quantity of stakeholders and serving a wider range of needs and demands. In light of this imperative, this article focuses on ten issues that have long existed but may impact on the healthy growth of ODE. This is not an exhaustive list of issues of concern for ODE researchers but a cri de coeur for researching ODE's significant problems.

Indeed, now that ODE has entered the wider education sector through the "front door," researchers should seize this opportunity to strengthen its presence as a mainstream mode of education in the educational ecology. To this end, researchers need to resist the temptation of instant benefits brought about by one-off, short-duration studies and adopt a longitudinal approach to ODE research. Pilot studies must be further scaled up and generalized to maximize their relevance beyond the case under investigation and cater to the sociocultural uniqueness of particular ODE contexts. Meanwhile, despite a greater probability of success, educational experiments are never immune to failure; both successful and unsuccessful educational interventions merit research attention and efforts. Education is a fundamentally human transaction, and its complexity requires the adoption of a systems approach to as well as human agency in undertaking educational research; ODE is no exception. Given that underprivileged and disadvantaged populations have always been the concern of the ODE community, it is ODE researchers' moral and social responsibility to include members of this group as subjects of their research so that their needs can be duly nurtured. Compared with other sectors of education, ODE may be more politically driven, and the importance of policy research is self-evident. Equally critical are lessons from ODE history, knowledge of which may shape future development in the field as well as help practitioners avoid repeating the same mistakes again and again. Finally, existing ODE theories need to be revisited, with the aim of better informing emerging practices or practices in new contexts and even developing new theories.

It is worth noting that studies pertaining to the above issues usually do not bring immediate benefits to the researchers, impactful as they are. Patience and commitment are called for: two desirable qualities that all serious researchers, regardless of disciplinary backgrounds, must possess.

References

Anderson, T. (2016). Theories for learning with emerging technologies. In G. Veletsianos (Ed.), *Emergence and innovation in digital learning: Foundations and applications* (pp. 35–50). Athabasca University Press. https://doi.org/10.15215/aupress/9781771991490.01

Arnò, S., Galassi, A., Tommasi, M., Saggino, A., & Vittorini, P. (2021). State-of-the-art of commercial proctoring systems and their use in academic online exams. *International Journal of Distance Education Technologies*, *19*(2), 55–76. http://doi.org/10.4018/IJDET.20210401.oa3

Baggaley, J. (2014). MOOC postscript. *Distance Education*, *35*(1), 126–132. https://doi.org/10.1080/01587919.2013.876142

Baggaley, J. (2017). 在线教育症结何在? [Where did online education go wrong?] *Distance Education in China*, *4*, 5–14. https://doi.org/10.13541/j.cnki.chinade.2017.04.001

Bates, A. W. (2016). 自动化还是赋权:在线学习路在何方 [Automation or empowerment: Online learning at the crossroads]. *Distance Education in China*, *4*, 5–11. http://doi.org/10.13541/j.cnki.chinade.20160505.010

Bayyat, M., Abu Muaılı, Z. H., & Aldabbas, L. (2021). Online component challenges of a blended learning experience: A comprehensive approach. *Turkish Online Journal of Distance Education*, *22*(4), 277–294. http://doi.org/10.17718/tojde.1002881

Bond, M., Bedenlier, S., Marín, V. I., & Händel, M. (2021). Emergency remote teaching in higher education: Mapping the first global online semester. *International Journal of Educational Technology in Higher Education*, *18*, Article 50. http://doi.org/10.1186/s41239-021-00282-x

Bond, M., Zawacki-Richter, O., & Nichols, M. (2019). Revisiting five decades of educational technology research: A content and authorship analysis of the *British Journal of Educational Technology*. *British Journal of Educational Technology*, *50*(1), 12–63. https://doi.org/10.1111/bjet.12730

Bozkurt, A. (2019). Intellectual roots of distance education: A progressive knowledge domain analysis. *Distance Education*, *40*(4), 497–514. http://doi.org/10.1080/01587919.2019.1681894

Bozkurt, A., Akgun-Ozbek, E., Yilmazel, S., Erdogdu, E., Ucar, H., Guler, E., Sezgin, S., Karadeniz, A., Sen-Ersoy, N., Goksel-Canbek, N., Dincer, G. D., Ari, S., & Aydin, C. H. (2015). Trends in distance education research: A content analysis of journals 2009–2013. *The International Review of Research in Open and Distributed Learning*, *16*(1). https://doi.org/10.19173/irrodl.v16i1.1953

Bozkurt, A., Jung, I., Xiao, J., Vladimirschi, V., Schuwer, R., Egorov, G., Lambert, S. R, Al-Freih, M., Pete, J., Olcott, D., Jr., Rodes, V., Aranciaga, I., Bali, M., Alvarez, A. V., Jr., Roberts, J., Pazurek, A., Raffaghelli, J. E., Panagiotou, N., Coëtlogon, P. de, … Paskevicius, M. (2020). A global outlook to the interruption of education due to COVID-19 pandemic: Navigating in a

time of uncertainty and crisis. *Asian Journal of Distance Education*, *15*(1), 1–126. http://doi.org/10.5281/zenodo.3878572

Bozkurt, A., & Zawacki-Richter, O. (2021). Trends and patterns in distance education (2014–2019): A synthesis of scholarly publications and a visualization of the intellectual landscape. *The International Review of Research in Open and Distributed Learning*, *22*(2), 19–45. https://doi.org/10.19173/irrodl.v22i2.5381

Bulfin, S., Henderson, M., & Johnson, N. (2013). Examining the use of theory within educational technology and media research. *Learning, Media and Technology*, *38*(3), 337–344. https://doi.org/10.1080/17439884.2013.790315

Çakiroğlu, Ü., Kokoç, M., Gökoğlu, S., Öztürk, M., & Erdoğdu, F. (2019). An analysis of the journey of open and distance education: Major concepts and cutoff points in research trends. *The International Review of Research in Open and Distributed Learning*, *20*(1). https://doi.org/10.19173/irrodl.v20i1.3743

Christensen, G. S., Steinmetz, A., Alcorn, B., Bennett, A., Woods, D., & Emanuel, E. J. (2013). *The MOOC phenomenon: Who takes massive open online courses and why?* SSRN. https://doi.org/10.2139/ssrn.2350964

Cluskey, G. R., Ehlen, C. R., & Raiborn, M. H. (2011). Thwarting online exam cheating without proctor supervision. *Journal of Academic and Business Ethics*, *4*, 1–7. https://www.aabri.com/manuscripts/11775.pdf

Davis, V. L. (2018). U.S. federal policy in distance education. In M. G. Moore & W. C. Diehl (Eds.), *Handbook of distance education* (4th ed., pp. 351–365). Routledge. https://doi.org/10.4324/9781315296135

Dempsey, K. B., Dempsey, C. W., & Boyles, C. A. (2021). Factors affecting interactive television course satisfaction. *American Journal of Distance Education*, *35*(3), 246–255. https://doi.org/10.1080/08923647.2021.1928433

Dennis, A., & Valacich, J. (2015). A replication manifesto. *AIS Transactions on Replication Research*, *1*, Article 1. http://doi.org/10.17705/1atrr.00001

Diehl, W. C. (2018). Management, policy, and administration: An overview. In M. G. Moore & W. C. Diehl (Eds.), *Handbook of distance education* (4th ed., pp. 321–322). Routledge. https://doi.org/10.4324/9781315296135

Downes, S. (2023). Newer theories for digital learning spaces. In O. Zawacki-Richter & I. Jung (Eds.), *Handbook of open, distance and digital education* (pp. 129–146). Springer. https://doi.org/10.1007/978-981-19-2080-6_8

Fernandez-Dıaz, E., Rodrıguez-Hoyos, C., Belver Domınguez, J. L., & Calvo Salvador, A. (2020). Who takes a MOOC? Profile of students in the framework of a European project. *Turkish Online Journal of Distance Education*, *21*(2), 1–16. https://doi.org/10.17718/tojde.727968

Fryer, L. K., Shum, A., & Nakao, K. (2023). Motivation to learn in open, distance, and digital education. In O. Zawacki-Richter & I. Jung (Eds.), *Handbook of open, distance and digital education* (pp. 931–947). Springer. https://doi.org/10.1007/978-981-19-2080-6_52

Gaskell, A. (2017). Open distance learning. In M. A. Peters (Ed.), *Encyclopaedia of educational philosophy and theory* (pp. 1688–1693). Springer. https://doi.org/10.1007/978-981-287-588-4_215

Gaskell, A., & Mills, R. (2017). 新技术使更多人接受高等教育了吗? [Have new technologies improved access to higher education?] *Distance Education in China*, *1*, 20–29, 79–80. https://doi.org/10.13541/j.cnki.chinade.20161220.003

Hao, D., & Xiao, J. (2021). 从学习效果和教育公平的角度看高等教育人工智能应用 ——一项基于多个数据库英文同行评审期刊文献的综述[Applying artificial intelligence in higher education to enhance learning outcomes and educational equity: A review of empirical studies in English journals]. *Modern Educational Technology*, *31*(4), 13–20. http://doi.org/10.3969/j.issn.1009-8097.2021.04.002

Holmberg, B. (1983). Guided didactic conversation in distance education. In D. Sewart, D. Keegan, & B. Holmberg (Eds.), *Distance education: International perspectives* (pp. 114–122). Croom Helm.

Honig, C. A., & Salmon, D. (2021). Learner presence matters: A learner-centered exploration into the community of inquiry framework. *Online Learning*, *25*(2), 95–119. https://doi.org/10.24059/olj.v25i2.2237

Jha, J., & Ghatak, N. (2023). Open schools in developing countries. In O. Zawacki-Richter & I. Jung (Eds.), *Handbook of open, distance and digital education* (pp. 493–508). Springer. https://doi.org/10.1007/978-981-19-2080-6_27

Juarez, B. C., & Critchfield, M. (2021). Virtual classroom observation: Bringing the classroom experience to pre-service candidates. *American Journal of Distance Education*, *35*(3), 228–245. https://doi.org/10.1080/08923647.2020.1859436

Jung, I. (2019a). Conclusion: Linking theory, research and practice in open and distance education. In I. Jung (Ed.), *Open and distance education theory revisited: Implications for the digital era* (pp. 115–122). Springer. https://doi.org/10.1007/978-981-13-7740-2_13

Jung, I. (2019b). Introduction to theories of open and distance education. In I. Jung (Ed.), *Open and distance education theory revisited: Implications for the digital era* (pp. 1–9). Springer. https://doi.org/10.1007/978-981-13-7740-2_13

Jung, I. (Ed.). (2019c). *Open and distance education theory revisited: Implications for the digital era*. Springer. https://doi.org/10.1007/978-981-13-7740-2

Jung, I. (2020). 文化视角下远程开放教育理论建构和应用的 “背景化—普适化—再背景化循环”[A contextualization–generalization–recontextualization cycle in open and distance education

theory building and application: A cultural perspective]. *Distance Education in China*, 8, 33–44. https://doi.org/10.13541/j.cnki.chinade.2020.08.005

Kapur, M. (2008). Productive failure. *Cognition and Instruction*, *26*(3), 379–424. https://doi.org/10.1080/07370000802212669

Kimmons, R. (2020). Current trends (and missing links) in educational technology research and practice. *TechTrends*, *64*, 803–809. https://doi.org/10.1007/s11528-020-00549-6

Kram, J., & Dinsmore, A. (2014, September 15). Publication bias against negative findings is detrimental to the progression of science. *LSE Impact Blog*. https://blogs.lse.ac.uk/impactofsocialsciences/2014/09/15/publication-bias-negative-findings-detrimental/

Mishra, S., Sahoo, S., & Pandey, S. (2021). Research trends in online distance learning during the COVID-19 pandemic. *Distance Education*, *42*(4), 494–519. https://doi.org/10.1080/01587919.2021.1986373

Moore, M. G. (1972). Learner autonomy: The second dimension of independent learning. *Convergence*, *5*(2), 76–88. https://www.proquest.com/docview/1437898934?pq-origsite=gscholar&fromopenview=true

Moore, M. G. (1973). Toward a theory of independent learning and teaching. *The Journal of Higher Education*, *44*(9), 661–679. https://doi.org/10.1080/00221546.1973.11776906

Moore, M. G. (1983). On a theory of independent study. In D. Stewart, D. Keegan, & B. Holmberg (Eds.), *Distance education: International perspectives* (pp. 69–94). Croom Helm.

Moore, M. G. (1989). Editorial: Three types of interaction. *American Journal of Distance Education*, *3*(2), 1–7. https://doi.org/10.1080/08923648909526659

Moore, M. G. (1993). Theory of transactional distance. In D. Keegan (Ed.), *Theoretical principles of distance education* (pp. 20–35). Routledge. https://doi.org/10.4324/9780203983065

Moore, M. G. (2008). Where is the historical research? *American Journal of Distance Education*, *22*(2), 67–71. http://doi.org/10.1080/08923640802035014

Moore, M. G. (2014). 从无线电广播到虚拟大学:美国远程教育历史亲历者的反思[From radio to the virtual university: Reflections on the history of American distance education from one who was there]. *Distance Education in China*, *1*, 24–34, 58. http://doi.org/10.13541/j.cnki.chinade.2014.01.008

Moore, M. G., & Diehl, W. C. (Eds.). (2018). *Handbook of distance education* (4th ed.). Routledge. https://doi.org/10.4324/9781315296135

Moore, M. G., & Kearsley, G. (1996). *Distance education: A systems view*. Wadsworth Publishing Company.

Moore, M. G., & Kearsley, G. (2012). *Distance education: A systems view of online learning* (3rd ed.). Wadsworth Publishing Company.

Panda, S. (1992). Distance educational research in India: Stock-taking, concerns and prospects. *Distance Education*, *13*(2), 309–26. https://doi.org/10.1080/0158791920130211

Paul, R. (2014). Organization and management of online and distance learning. In O. Zawacki-Richter & T. Anderson (Eds.), *Online distance education: Towards a research agenda* (pp. 175–196). Athabasca University Press. https://doi.org/10.15215/aupress/9781927356623.01

Peng, Y., & Xiao, J. (2022). Is the empirical research we have the research we can trust? A review of distance education journal publications in 2021. *Asian Journal of Distance Education*, *17*(2), 1–18. https://doi.org/10.5281/zenodo.7006644

Perraton, H. (2000). Rethinking the research agenda. *The International Review of Research in Open and Distance Learning*, *1*(1). https://doi.org/10.19173/irrodl.v1i1.5

Peters, O. (1973). *Die didaktische Struktur des Fernunterrichts: Untersuchungen zu einer industrialisierten Form des Lehrens und Lernen* [The didactic structure of distance learning: investigations into an industrialized form of teaching and learning] [Unpublished doctoral dissertation]. University of Tübingen.

Prinsloo, P. (2018). 反思 2017 年多伦多在线学习世界大会:我听到的和没有听到的[What I heard and what I did not hear: Reflections on the World Conference on Online Learning, Toronto, 2017]. *Distance Education in China*, *2*, 5–11. https://doi.org/10.13541/j.cnki.chinade.20180125.002

Prinsloo, P., Slade, S., & Khalil, M. (2020). 生态系统观视角下的学习分析 [Implementing learning analytics: An ecosystemic perspective]. *Distance Education in China*, *4*, 1–11. https://doi.org/10.13541/j.cnki.chinade.2020.04.001

Reeves, T., & Lin, L. (2020). The research we have is not the research we need. *Education Tech Research Dev*, *68*, 1991–2001. https://doi.org/10.1007/s11423-020-09811-3

Roberts, J., & van der Walt, H. D. (2021). Distance education research in South Africa: A longitudinal study into the research levels of ODL journal articles. *UnisaRxiv*. Advance online publication. https://doi.org/10.25159/UnisaRxiv/000012.v1

Saba, F. (2000). Research in distance education: A status report. *The International Review of Research in Open and Distance Learning*, *1*(1). https://doi.org/10.19173/irrodl.v1i1.4

Scully, D., O'Leary, M., & Brown, M. (2018). *The learning portfolio in higher education: A game of snakes and ladders*. Dublin City University, Centre for Assessment Research Policy & Practice in Education (CARPE), and National Institute for Digital Learning (NIDL). https://www.dcu.ie/sites/default/files/inline-files/Learning%20Portfolios%20in%20Higher%20Education%202018.pdf

Selwyn, N. (2012). Ten suggestions for improving academic research in education and technology. *Learning, Media and Technology*, *37*(3), 213–219. https://doi.org/10.1080/17439884.2012.680213

Simonson, M., Schlosser, C., & Orellana, A. (2011). Distance education research: A review of the literature. *Journal of Computing in Higher Education*, *23*, 124–142. https://doi.org/10.1007/s12528-011-9045-8

Song, Y., & Xiao, J. (2017). 再谈移动学习—访英国移动学习教授约翰·特拉克斯勒 [Mobile learning revisited—An interview with Professor John Traxler]. *Distance Education in China*, *11*, 43–46. https://doi.org/10.13541/j.cnki.chinade.20171120.009

Stadler, M., Kolb, N., & Sailer, M. (2021). The right amount of pressure: Implementing time pressure in online exams. *Distance Education*, *42*(2), 219–230. https://doi.org/10.1080/01587919.2021.1911629

Subotzky, G., & Prinsloo, P. (2011). Turning the tide: A socio-critical model and framework for improving student success in open distance learning at the University of South Africa. *Distance Education*, *32*(2), 177–193. https://doi.org/10.1080/01587919.2011.584846

Traxler, J., & Crompton, H. (2015). 文化视角下的移动学习 [Considering cultural dimensions: The transfer of mobile learning across cultures]. *Distance Education in China*, *10*, 5–14. http://doi.org/10.13541/j.cnki.chinade.2015.10.003

Tynan, B., Bossu, C., & Leitch, S. (2023). Academic professional development to support mixed modalities. In O. Zawacki-Richter & I. Jung (Eds.), *Handbook of open, distance and digital education* (pp. 659–674). Springer. https://doi.org/10.1007/978-981-19-2080-6_36

Ukwoma, S. C., & Ngulube, P. (2021, April 8). Trends and patterns of theory use in open and distance education research journals 2009–2018. *Open Learning: The Journal of Open, Distance and e-Learning*. https://doi.org/10.1080/02680513.2021.1911793

Viberg, O., Khalil, M., & Baars, M. (2020). Self-regulated learning and learning analytics in online learning environments: A review of empirical research. In *LAK '20: Proceedings of the Tenth International Conference on Learning Analytics & Knowledge* (pp. 524–533). Association for Computing Machinery. https://doi.org/10.1145/3375462.3375483

Wedemeyer, C. A. (1981). *Learning at the back door: Reflections on non-traditional learning in the lifespan*. University of Wisconsin Press.

Xiao, J. (2018). On the margins or at the center? Distance education in higher education. *Distance Education*, *39*(2), 259–274. https://doi.org/10.1080/01587919.2018.1429213

Xiao, J. (2021). From equality to equity to justice: Should online education be the new normal in education? In A. Bozkurt (Ed.), *Handbook of research on emerging pedagogies for the future of education: Trauma-informed, care, and pandemic pedagogy* (pp. 1–15). IGI Global. https://doi.org/10.4018/978-1-7998-7275-7.ch001

Xiao, J. (2023a). Introduction to history, theory, and research in ODDE. In O. Zawacki-Richter & I. Jung (Eds.), *Handbook of open, distance and digital education* (pp. 15–25). Springer. https://doi.org/10.1007/978-981-19-2080-6_1

Xiao, J. (2023b). Michael Grahame Moore. In B. A. Geier (Ed.), *The Palgrave handbook of educational thinkers* (pp. 1–15). Palgrave Macmillan. https://doi.org/10.1007/978-3-030-81037-5_172-1

Zawacki-Richter, O., Alturki, U., & Aldraiweesh, A. (2017). Review and content analysis of *the International Review of Research in Open and Distance/Distributed Learning* (2000–2015). *International Review of Research in Open and Distributed Learning, 18*(2), 1–26. http://www.irrodl.org/index.php/irrodl/article/view/2806/4090

Zawacki-Richter, O., & Anderson, T. (Eds.). (2014). *Online distance education: Towards a research agenda*. Athabasca University Press. https://doi.org/10.15215/aupress/9781927356623.01

Zawacki-Richter, O., & Latchem, C. (2018). Exploring four decades of research in *Computers & Education*. *Computers & Education*, *122*, 136–152. https://doi.org/10.1016/j.compedu.2018.04.001

Zawacki-Richter, O., & Naidu, S. (2016). Mapping research trends from 35 years of publications in *Distance Education*. *Distance Education, 37*(3), 245–269. https://doi.org/10.1080/01587919.2016.1185079

International **R**eview of **R**esearch in **O**pen and **D**istributed **L**earning
Volume 24, Number 2

May – 2023

The UNESCO OER Recommendation: Some Observations from the ICDE OER Advocacy Committee

Ebba Ossiannilsson[1], Rosa Leonor Ulloa Cazarez[2], Cristine Martins Gomes de Gusmão[3], Xiangyang Zhang[4], Constance Blomgren[5], Trish Chaplin-Cheyne[6], & Daniel Burgos[7]

[1]Professor, Swedish Association for Open, Flexible and Distance Education, Sweden; [2]Research Professor, Virtual University, Universidad de Guadalajara, Mexico; [3]Associate Professor, Federal University of Pernambuco, Brazil; [4]Emeritus Professor, Jiangsu Open University/ Director of Research Institute for Open Education, Suqian University, China; [5]Associate Professor, Athabasca University, Canada; [6]Director of Learning and Teaching Development, Otago Polytechnic | Te Pūkenga, New Zealand; [7]Professor, Research Institute for Innovation & Technology in Education (UNIR iTED), Universidad Internacional de La Rioja (UNIR), Spain

Abstract

In this article, ambassadors of the International Council for Open and Distance Education (ICDE) Open Educational Resources (OER) Advocacy Committee (OERAC) provide a snapshot of regional and global Open Educational Resources (OER) initiatives. This committee has been active since 2017 with membership renewed biannually. The ambassadors work to further OER awareness and understanding, to increase global recognition of OER, and provide policy support for the acceptance and application of OER. This overview highlights national and regional initiatives associated with the UNESCO OER recommendation and the five action areas that include: building capacity and leveraging OER; developing supporting policies; ensuring equity and effectiveness; encouraging sustainable OER model development; and, promoting and facilitating international collaboration. In addition, monitoring and evaluation of the action areas are suggested to be prioritized. This overview is not exhaustive, and much work remains to implement the OER Recommendation at scale, maximize its implementation, connect these recommendations to the United Nation's Sustainable Development Goals (SDGs), along with the futures of education with a new social contract for education, individuals, and the planet.

Keywords: open educational resources, UNESCO OER recommendation, OER advocacy, distance education

Introduction

In 2017, the International Council for Distance Education (ICDE) established the first Open Educational Resources (OER) Advocacy Committee (OERAC) whose mission is to increase global recognition of OER worldwide and provide policy support for the uptake, use, and reuse of OER. Committee membership seeks representatives from each continent and has been renewed every two years (ICDE, 2023; Ossiannilsson, et al., 2020). In this article, current ambassadors of the OERAC provide a snapshot of regional and global OER initiatives.

In March 2020, due to the COVID-19 pandemic, most sectors around the world went online, not least the educational sectors, and most educational institutions and stakeholders became aware of the Internet as a resource and tool for continuity of work. More or less all educational organizations around the world began to offer online and distance learning, with the use of more technology, digitalization, and OER, taking steps that were started over 25 years ago by many online educational providers. When connectivity and access to sources, tools, and software were not limitations, the online setting opened possibilities for anyone to learn anything (Bozkurt et al., 2020; Ossiannilsson et al., 2020; Stracke at al., 2022).

Before the pandemic, the 2030 Agenda for Sustainable Development, adopted by all United Nations member states in 2015, provided a common blueprint for peace and prosperity for people and the planet, now and in the future. Its centerpiece is the 17 Sustainable Development Goals (SDG), which represent an urgent call to action by all countries as part of a global partnership. They recognize that eradicating poverty and other deprivations must go hand in hand with strategies to improve health and education, reduce inequalities, and promote economic growth—all while combating climate change and protecting our oceans and forests (UNESCO, 2016). Four years later, the UNESCO initiative on the futures of education and a new social contract for education was launched, aimed at rethinking education and shaping the future for individuals and the planet. This initiative stimulates a global debate about how knowledge, education, and learning must be reconceptualized in a world of increasing complexity, uncertainty, and precarity (UNESCO, 2019a). UNESCO (2019b) also notes that OER are a catalyst for achieving the SDGs, particularly SDG 4, which relates to education. OER are now defined as follows (UNESCO, 2019):

> Open Educational Resources (OER) are learning, teaching, and research materials in any format and medium that reside in the public domain or are under copyright that have been released under an open license, that permit no-cost access, re-use, re-purpose, adaptation, and redistribution by others.

OER are a catalyst for change toward the open movement and for human rights, equity, social justice, and the common good. The futures of education are being transformed by the use of learning technologies, particularly in hybrid and online learning environments that challenge institutional and personal capacity to ensure access for all (UNESCO, 2019a).

The UNESCO OER Recommendation

A milestone was reached in 2019, when UNESCO member states unanimously adopted the OER Recommendation for global implementation (UNESCO, 2019). The Recommendation covers five areas: building capacity and using OER; developing supportive policies; ensuring equitable access to quality OER; promoting the creation of sustainable OER models; promoting and facilitating international cooperation; and in addition, monitoring and evaluation are emphasized. OER are valued as a catalyst for innovation and the realization of UNESCO SDG 4: education for all, accessibility, equity, equality, inclusion, diversity, lifelong learning, and the higher values of social justice and human rights. The OER recommendation will be a catalyst for achieving SDG 5 (gender equality), SDG 9 (industry, innovation, and infrastructure), SDG 10 (reducing inequalities within and between countries), SDG 16 (peace, justice, and strong institutions), and SDG 17 (partnerships for the goals).

Since access to quality education through OER impacts human rights and social justice, the UNESCO OER recommendation is critical. In 2020, the impact of the global COVID-19 pandemic clearly demonstrated the importance of opening up education and access to internationally recognized, qualified learning resources. This article describes how the promise of resilient, sustainable, and high-quality open education is being addressed in different regions as part of operationalizing the five action areas. The Recommendation has opened up the opportunity for all actors in the education sector to contribute and now includes formal, non-formal, and informal actors. Non-formal learning takes place outside formal learning environments but within some kind of organizational framework, while informal learning takes place outside schools and colleges and arises from the learner's involvement in activities that are not undertaken with a learning purpose in mind. (Council of Europe, n.d.).

Notes From the Field Around the Globe: Ambassadors' Observations

This section briefly summarizes notes from the field of the ICDE OERAC ambassadors on OER initiatives from their regions and in total represent many parts of the globe. The regions appear in alphabetical order: Asia, Europe, Oceania, North America, and South America. Ambassadors have also previously published observations related to the UNESCO OER recommendation (Ossiannilsson, 2020; Ossiannilsson et al., 2021; Ossiannilsson et al., 2022).

Asia

OER in Asia have been converted to the format of massive online open courses (MOOCs). The main driver is the Asian Association of Open Universities, which has established a MOOCs learning centre with a wide range of courses developed by its member universities, mainly from southeast and south Asia (e.g. India, the Philippines, Indonesia, and Malaysia) and the open universities in east Asia, especially the Open University of Hong Kong. The latter, which has been renamed the Metropolitan University and transformed into a traditional campus university, has been actively involved in the creation of OER including MOOCs.

In recent years, Tsinghua University has jointly organized a World Conference on MOOCs with UNESCO and the Chinese Ministry of Education every October or November. Since the first conference in Beijing, a

MOOC alliance has been at work. At the initiative of the Ministry of Education of China, two new national platforms in the Chinese language have been established in cooperation with ministries and giant telecommunication and high technology corporations in China, one serving basic education and one for tertiary education to which 10 more existing MOOC platforms such as iCOURSE and CNMOOCs have been added at the outbreak of COVID-19 (Bozkurt et al., 2020). Because of the pandemic, the idea of open, flexible, and distance education have been embedded more or less in the minds of conventional universities that participate actively in providing OER in the form of courses. A small quantity of academic courses created by open universities contribute to the popular national MOOC platforms. Jiangsu Open University has also already added about five courses to China MOOCs platform for full-time students. In 2022, the Open University of China started to establish its own freely accessed platform with more than 500 short courses for lifelong learners. The platform is currently in operation with the ambition to be the online learning hub intended for working adults in China.

The quality of OER has been evaluated and monitored by the associations of creators and the learning platforms where the courses are offered. Funding also comes from universities and colleges, mainly for the reason that it is an honor and privilege to create a course on the national learning platform. All courses uploaded to the learning platform must be used for at least three rounds of learning. The responsibility of maintaining the courses lies with the creators, who are motivated to maintain the life expectancy of their courses as long as possible by promoting them on social media in China.

Europe

In 2022, *Germany* adopted a national strategy on OER (Bundesministerium für Bildung und Forschung, 2022). This strategy briefly explains that the modernization of the educational landscape in Germany is a central social process. In a culture of digitality, modern education is digitally supported education with digital competencies and skills being important. They complement the cultural and conventional skills of reading, writing, mathematics and critical thinking. Digital education spaces are the necessary extension of classrooms, seminar rooms, and lecture halls that have long and exclusively defined the concept of education. Digital tools, media, and platforms connect teachers and students to the world around them. At the heart of digital networking is communicating, sharing, and collaborating—regardless of time or place. Also influential is the simplified use, production, and further development of educational materials. Learning materials are the central object, carrier, and fuel in teaching and learning processes and in the competence development of learners and teachers. The Federal Ministry of Education and Research (BMBF) wants to support the innovative design space of digital educational media and materials and promote modernization and innovation in education. Because of these aspirations, OER offer special potential for cooperation and collaboration, competence development, and the development of new pedagogical practices to support the development of learners and teachers in all areas of education in a 21st-century digital living and working world. With its OER strategy, the BMBF is addressing current developments and setting the framework for an innovation space in which the potential of free educational materials can unfold and have a long-term and lasting impact.

In the *Netherlands*, the Minister of Education, Culture, and Science provides funding as part of the incentive system for open and online education coordinated by SURF. SURF is a cooperative association of Dutch educational and research institutions in which members join together in their digital services and

innovations, with the SURF members owning its outputs. The incentive system comprises two pillars: online education and open learning materials. The rationale and goal cited is that online education provides opportunities for innovation and quality improvement in higher education. (SURF, 2021).

In *Norway,* the Norwegian Digital Learning Arena (NDLA) is a joint provincial enterprise providing open digital learning content for upper secondary education. The NDLA is not only a compilation of open educational resources, but also offers a number of other online tools for sharing and collaboration. The NDLA produces freely available digital learning resources for upper secondary education (https://ndla.no/) and its goal is to contribute to increased collaboration in teaching and learning, the development and sharing of expertise, and the promotion of service offerings and technologies within the edtech sector. On the platform, the NDLA offers over 22,000 learning resources in 146 examination subjects. The learning resources are of high quality, professionally up-to-date, and developed in collaboration with qualified teachers and students. In 2021, the platform recorded nearly 15 million visits (NDLA, 2022).

In *Spain*, the Open Education Policy at the Universidad Internacional de La Rioja (UNIR) (Burgos, 2017a) represents a firm commitment to finding a model of sustainability between proprietary and open approaches. In 2017, at UNIR, a pioneering policy at the international level for an online university and a Spanish-language university was unanimously approved by all members of the University Council. In the process, this policy was validated by 27 external reviewers from five continents who are active and recognized members of the open movement. It was an exercise in transparency and integrated work. This policy is based on a practical approach that facilitates the integration of open resources into the University's formal programs by students, faculty members, and academic leaders. In this way, formal learning is combined with non-formal and informal learning, and the wide variety of high-quality, internationally available content is validated as part of the educational process in the University's portfolio. The policy goes beyond content, as the pillars of open education, as described by Burgos (2017b, 2020), are several: content, methodology, research data, research results, policy, licensing, technology, access, accreditation, certification, interoperability, and practices (i.e., as in Open Educational Practices, OEP). For this reason, the University is also committed to an open approach in all of these areas. In this specific example, more than 25% of UNIR's academic instructional production is available as open access. Examples of this open sharing include the video repository UNIR TV (UNIR, 2009), which collects more than one million educational videos, or through the open courses portal OpenEd (UNIR, 2017b), created by the UNIR Research Institute iTED (UNIR, 2017a), which aggregates and facilitates access to all the results of the projects carried out by UNIR and funded internationally. This sharing mindset implies a strong commitment of the University to the design, use, integration, and production of resources and educational policies, along with the other pillars.

In *Sweden*, a group of volunteers founded Meeting Place OER (Mötesplats OER, 2020) and translated the UNESCO OER Recommendation. They have also hosted two national conferences for policymakers to mark the anniversary of the UNESCO OER Recommendation, in 2021 and 2022. In 2021, the government commissioned the Royal Library to map and analyze the use of OER and public participation in the research process. The assignment is to be conducted with a focus on the general library system. While carrying out the assignment, the Royal Library will seek opinions from the State Board of Education, universities and colleges, the National Heritage Authority, the university chancellor's Offices, the Swedish Research Council,

and other relevant agencies and organizations. In addition, experience within Digisam ~~is~~ a platform where 22 governmental cultural heritage stakeholders work together to digitize cultural heritage will be considered. Digisam strives to ensure that websites are accessible to everyone as part of enhancing equitable access in this area of open education.

The Royal Library was also given an assignment for investigation on open science, which has been a priority area in the European Commission's strategies, guidelines, and recommendations since 2016. Public transparency and participation in research and innovation projects are factors that can contribute to a better understanding of scientific processes. Participation can take the form of citizen science or other forms of co-creation, for example, in which stakeholders are given influence over the research process in different ways. In the Research and Innovation Policy Proposal Research, Freedom, Future—Knowledge and Innovation for Sweden (Research, freedom, future, 2020), the government stated that access to fact-based knowledge and information is an important tool to strengthen people's resilience in stressful times and to protect human rights in an equitable, safe, and sustainable way. The 2020 Research and Innovation Policy Bill maintains that universities need digital education services to meet society's growing need for skills transfer and lifelong learning. According to the Library Act (2013, p. 801), libraries in the public library system must work for the development of democratic society by contributing to the transmission of knowledge and the free formation of opinion. Libraries in the public library system must also promote the value of literature and interest in education, information, training and research, and cultural activities in general (Research, freedom, future, 2020).

The results of the Royal Library's investigation show that there are great benefits to increased use of open learning resources. This is primarily for access to quality resources for learning in formal education, but also for lifelong learning and education. There are also benefits to universities and colleges when open learning resources are developed and used collaboratively and on a larger scale. The public library system has an important role to play in connecting the public with open-access learning resources from universities and other educational institutions. If nothing else, university libraries can help faculty and students at all levels of education find, use, and disseminate open learning resources. In early 2023, the Royal Library (Kungliga Biblioteket) will also present a related survey and analysis of public participation in the research process, with a focus on public librarianship (Kungliga Biblioteket, 2022).

On December 16, 2022, the Ministry of Education hosted a meeting on OER inviting 20 stakeholders from various sectors to discuss the upcoming monitoring and evaluation of the OER Recommendation. One of the meeting outcomes was the need for increased collaboration between the sectors involved and the establishment of a number of working groups for more robust national strategies. Today, there are official translations from the Swedish National Council UNESCO for both the UNESCO Open Science Recommendation (UNESCO, 2021b) and the OER Recommendation (UNESCO, 2022).

Oceania

In *New Zealand*, two Te Ama Ako team members from Otago Polytechnic Ltd., led by Wayne Mackintosh, have been involved in creating new open courses: "Digital Skills for OER Sharing" (DS4OERS), for Pacific nations (an initiative of the Commonwealth of Learning, New Zealand's Foreign Affairs and Trade Aid Programme and the Pacific Centre for Flexible and Open Learning for Development); the online course

"Empowered Digital Teacher for Online Learning" for Pacific Island educators; and a French-language version of "Open Education, Copyright, and Open Licensing in a Digital World" (in partnership with UNESCO, ICDE, and l'Université Numerique, France, to support the UNESCO OER recommendation in Francophone countries). Otago Polytechnic Ltd. has also developed the Multitopic format for Moodle, which is now widely used by the Moodle open-source community. The Multitopic format is a course format plugin and such plugins determine the layout of course material in Moodle. The Onetopic format used by Otago Polytechnic Ltd. is designed to present each topic on its own page, with a tab bar at the top of the pages containing links to each topic. Multitopic format is designed to display multiple topics on a page and, therefore, provides options to move, hide, or delete groups of resources together within a page. Course pages with multiple topics per page created in the Multitopic format are, therefore, easier to edit and use. The Multitopic format has already been installed on over 2,000 Moodle sites with implications for the course experience by thousands of learners including open courses.

North America

In *Canada*, interest in OER continues to make inroads. At the national level, the Canadian Association of Research Libraries has written an OER background paper for federal government politicians and officials. This paper provides the current benefits and challenges of using OER in Canadian higher education to help policy creators understand the merits of OER. Regionally, in addition to the ongoing efforts of BC Campus and eCampus Ontario, the Maritime provinces have established Atlantic OER, although stable funding for this initiative is lacking. These three organizations work to further innovations in open teaching and learning practices, with BC Campus leading the way. At a provincial level, the Alberta government explicitly listed OER as one aspect that supports increased access to higher education in their 10-year strategy for postsecondary education. This visioning recognition occurred through the collaborative advocacy work of university student associations and faculty members. In the fall of 2021, an Alberta textbook-broke campaign by several college and university student associations continued the advocacy and awareness-building for students regarding the benefits of OER. These provincial initiatives filter to other provinces, regions, and the national level through student and organizational networks.

The autumn of 2023 marks the international Open Education Global conference in Edmonton (also known as Amiskwacîwâskahikan) with the conference theme of "Building a Sustainable World through Open Education", with a subtheme focusing on Indigenous Peoples' knowledge systems that promote sustainability and facilitate the culturally appropriate transfer of Indigenous ways of knowing across systems through Traditional Knowledge Labels. Learning from and alongside Indigenous thought leaders about Indigenous knowledge systems and open education is an important aspect of this international conference and the continuing development of OER.

In *Mexico*, national initiatives to promote universal access to knowledge have been implemented with the creation of the Office for the Management of Universal Access to Knowledge (Consejo Nacional de Ciencia y Tecnología, 2022):

- a network of spaces for universal access to scientific, technological, and humanistic knowledge through the arts;

- a national policy for publishing research in national, fully open-access journals to support and recognize the editorial quality of journals committed to openness;

- an economic incentive for researchers linked to disseminating scholarship and academic research outputs in adequate formats for all types of audiences' readiness; and

- a network of Mexican institutional repositories, with the goal of connecting the digital repositories of higher-education institutions (Rasseli, 2021).

These initiatives are supported by government funding, and most higher education institutions are making additional efforts to build their repositories and frameworks. Though OERs are not yet part of a specific national policy, they can be integrated. Moreover, there is an effort to set up an environment of openness that will enable further transitions toward an inclusive and open educational practice.

South America

Currently, there is an incentive in *Brazil* for the practice of open education. One area that stands out in this regard is health. For at least the last 10 years, the material developed to support the training of health professionals in the Brazilian Unified Health System has been based on OER.

Actions related to open educational practices are disseminated in different places. Several public higher-education institutions are developing academic-scientific projects that promote the elaboration and dissemination of OER, which are used in basic courses and extension courses in the form of self-instruction. This initiative is very interesting because it adheres to the job and salary plan for health professionals at the federal, state, and local levels.

National actions are being transferred to several institutions in South America. A good example is the virtual learning environment of the health unified system of Brazil (AVASUS) of Laboratory of Technological Innovation in Health—(LAIS-) of Federal University of Rio Grande do Norte (UFRN), which offers more than 330 courses accessible through specializations or learning paths (Valentim et al., 2022). AVASUS is an environment that, in addition to providing courses since 2021, also offers OER that can be accessed after an initial registration. The methodology implemented in AVASUS is currently being used as the basis for enhancing the virtual environments of the PAHO/WHO Virtual Campus of Public Health. Another example of the development of working groups that lead actions in the field of open and distance education, as well as the development of OER, is carried out by UniREDE—Associação Universidade em Rede. In addition to these examples, there are many other initiatives, since the vast majority of Brazilian public universities have institutional repositories that provide access to OER. A study has been developed by Caitano et al (2022) in the field of mass education provides new data in an innovative approach to evaluating the contribution of the massive training of professionals. The aim was to monitor the effective transformation of the work process and professional practice related to the use of OER and the fulfilment of the Sustainable Development Goals.

Conclusions and Recommendations

The preceding overview has highlighted several national and regional initiatives related to the UNESCO OER recommendation. However, there are still many ongoing initiatives, and much work remains to be done to implement the OER Recommendation at scale, maximize implementation, and link it to the SDGs and the futures of education, with a new social contract for individuals and education that extends throughout the planet. In summary, more needs to be done at the global level, not least when it comes to implementing the five areas of the 2019 Recommendation: building capacity and leveraging OER, developing supporting policies, ensuring effectiveness and equity, promoting the creation of sustainable OER models, and facilitating international collaboration. As part of meeting these action areas, monitoring and evaluation should be prioritized to ensure OER is part of high quality, sustainable, and equitable education for all.

References

Bozkurt, A., Jung, I., Xiao, J., Vladimirschi, V., Schuwer, R., Egorov, G., Lambert, S. R., Al-Freih, M., Pete, J., Olcott, Jr., D. Rodes, V., Aranciaga, I., Bali, M., Alvarez, Jr., A. V., Roberts, J., Pazurek, A., Raffaghelli, J. E., Panagiotou, N., de Coëtlogon, P., Shahadu, S., Brown, M., Asino, T. I. Tumwesige, J., Ramírez Reyes, T., Barrios Ipenza, E., Ossiannilsson, E., Belhamel, K., Irvine, V., Sharma, R. C., Adam, T., Janssen, B., Sklyarova, T., Olcott, N. Ambrosino, A., Lazou, C., Mocquet, B., Mano, M., & Paskevicius, M. (2020). A global outlook to the interruption of education due to COVID-19 pandemic: Navigating in a time of uncertainty and crisis. *Asian Journal of Distance Education, 15*(1), 1–126. http://dx.doi.org/10.5281/zenodo.3878572

Bundesministerium für Bildung und Forschung. (2022). *OER-Strategie freie bildungsmaterialien für die entwicklung digitaler bildung*. [Free educational materials for the development of digital education] https://www.bmbf.de/SharedDocs/Publikationen/de/bmbf/3/691288_OER-Strategie.pdf?__blob=publicationFile&v=4&fbclid=IwAR1qh0yUMGHHbBi-42aeimBiVZ1g8wjhY9aIBkVrZNP1D2NO-kez5oQe4Wc

Burgos, D. (Ed.). (2017a). *Educación abierta* [Open education policy]. Universidad Internacional de la Rioja (UNIR). http://bit.ly/unir-openpolicy (English) and http://bit.ly/unir-educacionabierta (Español)

Burgos, D. (2017b). *Into the open: A transgenic evolution of the educational system.*[Conference presentation]. 27th ICDE World Conference on Online Learning, Toronto, Canada.

Burgos, D. (2020). About open science and open education (editorial). In D. Burgos (Ed.), *Radical solutions and open science: An open approach to boost higher education*. Springer. https://doi.org/10.1007/978-981-15-4276-3

Caitano, A. R., Gusmão, C. M. G., Dias-Trindade, S, Barbalho, I. M. P., Morais, P. S. G., Caldeira-Silva, G. J. P., Romão, M. H., Valentim, J. L. R. S., Dias, A. P., Alcoforado, J. L. M., Oliveira, C. A. P., Coutinho, K. D., Rêgo, M. C. F. D., & Valentim, R. A. M. (2022). Massive health education through technological mediation: Analyses and impacts on the syphilis epidemic in Brazil. *Frontiers in Public Health, 10*, 944213. https://doi.org/10.3389/fpubh.2022.944213

Consejo Nacional de Ciencia y Tecnología (CONACyT). (2022). *Acceso universal al conocimiento*. [Universal access to knowledge]. https://conacyt.mx/acceso-universal-al-conocimiento/

Council of Europe. (n.d.). *Formal, non-formal and informal learning*. https://www.coe.int/en/web/lang-migrants/formal-non-formal-and-informal-learning

Kungliga Biblioteket. (2022). *Öppna lärresurser har en outnyttjad potential*. [Open educational resources has unused potentials]. https://www.kb.se/samverkan-och-utveckling/nytt-fran-kb/nyheter-samverkan-och-utveckling/2022-10-20-oppna-larresurser-har-en-outnyttjad-potential.html

Library Act. (2013). *Bibliotekslagen* [Library Act]. https://www.riksdagen.se/sv/dokument-lagar/dokument/svensk-forfattningssamling/bibliotekslag-2013801_sfs-2013-801

Mötesplats OER. (2020). Mötesplats OER [Meetingplace OER]. https://www.motesplatsoer.se

NDLA. (2022). Om NDLA [About Norwegian Digital Learning Arena]. https://ndla.no/en/

Ossiannilsson, E. (2020). ICDE OERAC 2020 - Summary and reflections. [Unpublished manuscript]. Oslo: ICDE.

Ossiannilsson, E., Aydin, H., & Wetzler, J. (2021). *Report from the ICDE OER advocacy committee's survey 2020: Implementation of the UNESCO recommendation on open education resources*. International Council of Open and Distance Education. https://www.oerknowledgecloud.org/record2734

Ossiannilsson, E., Gusmão, C., Ulloa-Cazarez, R., & Obiageli Agbu, J.-F. (2022). *Open innovation framework: Emerging narratives from the ICDE OER advocacy committee*. ICDE OER Advocacy Committee. https://www.icde.org/knowledge-hub/open-innovation-framework-oerac-2022

Ossiannilsson, E., Zhang, X., Wetzler, J., Gusmão, C., Aydin, C. H., Jhangiani, R., Glapa-Grossklag, J., Makoe, M., & Harichandan, D. (2020). From open educational resources to open educational practices. *DMS-DMK, 31*. https://doi.org/10.4000/dms.5393

Rasseli, L.A. (2021, Oct. 21). Mexican Network of Institutional Repositories (REMERI) is reincorporated into LA Referencia. *Red Clara*. https://redclara.net/index.php/en/noticiasyeventos/noticias/2348-mexican-network-of-institutional-repositories-remeri-is-reincorporated-into-la-referencia

Research, freedom, future – knowledge and innovation for Sweden (2020). Bill 2020/21:60 (Sweden). https://www.regeringen.se/rattsliga-dokument/proposition/2020/12/forskning-frihet-framtid--kunskap-och-innovation-for-sverige/

Stracke, C.M., Burgos, D., Santos-Hermosa, G., Bozkurt, A., Sharma, R.C., Cassafieres, C.S., dos Santos, A.I., Mason, J., Ossiannilsson, E., Shon, J.G., Wan, M., Obiageli Agbu, J.-F., Farrow, R., Karakaya, Ö., Nerantzi, C., Ramírez-Montoya, M.S., Conole, G., Cox, G., & Truong, V. (2022). Responding to the initial challenge of the COVID-19 pandemic: Analysis of international responses and impact in school and higher education. *Sustainability, 14*, 1876. DOI: https://doi.org/10.3390/su14031876

SURF. (2021). *Open and online education incentive scheme*. https://www.surf.nl/en/open-and-online-education-incentive-scheme?dst=n2453

UNESCO. (2016). *Education 2030: Incheon Declaration and framework for action for the implementation of Sustainable Development Goal 4*.

https://uis.unesco.org/sites/default/files/documents/education-2030-incheon-framework-for-action-implementation-of-sdg4-2016-en_2.pdf

UNESCO. (2019). *Recommendation on Open Educational Resources (OER).* https://unesdoc.unesco.org/ark:/48223/pf0000373755/PDF/373755eng.pdf.multi.page=3

UNESCO. (2021a). *Reimagining our futures together: A new social contract for education.* https://unesdoc.unesco.org/ark:/48223/pf0000379707

UNESCO. (2021b). UNESCO's recommendation on open science. https://unesco.se/unescos-rekommendation-om-oppen-vetenskap/

UNESCO. (2022). *Unescos rekommendation för öppna lärresurser*. [UNESCO's recommendation for open educational resources]. https://unesco.se/?infomat=unescos-rekommendation-for-oppna-larresurser

UNIR (2009). *UNIR TV* [Video UNIR] (2017a). *Instituto de Investigación, Innovación y Tecnología Educativas (UNIR iTED)* [Research Institute for Innovation & Technology in Education (UNIR iTED)]. http://ited.unir.net/

UNIR (2017b). *OpenEd* (Open course repository). https://opened.unir.net/

United Nations. (1948). *Universal declaration of human rights*. https://www.un.org/en/about-us/universal-declaration-of-human-rights

Valentim, R. A. M., Oliveira, C. A. P., Oliveira, E. S. G., Ribeiro, E. L., Costa, S. M., Morais, I. R. D., Fernandes, F. R. S., Caitano A. R., Gusmão, C. M.G., Cunha-Oliveira, A., Rêgo, M. C. F. D., Coutinho, K. D., Barros, D. M. S., & Ceccim, R. B. (2022). Virtual learning environment of the Brazilian health system (AVASUS): Efficiency of results, impacts, and contributions. *Frontiers in Medicine, 9*. https://doi.org/10.3389/fmed.2022.896208