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Editorial – Volume 24, Issue 4

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Welcome to *IRRODL*'s last issue for 2023 that offers 14 research articles and three book reviews covering the ongoing growth and interest in open and flexible, distributed learning. Additionally, we would like to bring to your attention the Call for Papers posted on our website for the upcoming Special Issue on *Artificial Intelligence in Open and Distributed Learning: Does It Facilitate or Hinder Teaching and Learning?*, by guest editors Dr. Ehsan Namaziandost and Dr. Afsheen Rezan from Azad University in Ahvaz, Iran. This timely topic will most definitely be of interest to our readers as educators, researchers, and practitioners in open and distributed learning, though an exploration of opportunities and challenges surrounding AI, from multiple perspectives, and from a variety of spaces including distance education, hybrid learning, and blended learning. We encourage you to share with your networks and consider submitting an article yourself! The CFP will close on January 31st, 2024.

"Educational Technology Undergraduates' Performance in a Distance Learning Course Using Three Courseware Formats" provides results from a quasi-experimental design from Nigeria. The researchers, **Falode** and **Mohammed,** found that printed, video, and Moodle-based courseware formats were each needed to support student retention, achievement, and satisfaction.

Cisel researched "On the Ethical Issues Posed by the Exploitation of Users' Data in MOOC Platforms: Capturing Learners' Perspectives." This article examines the ethical implications and potential risks of learning analytics and MOOC participants' viewpoints regarding use of learner data.

Use of OER for English language learners in Iran was the focus of **Dashtestani** and **Suhrawardi's** study, **"**Discrepancies and Similarities Between Online and Face-to-Face Teachers' Use of Open Educational Resources (OER) for Teaching Purposes."

Auger, Baker, Connors, and **Martin** examined Indigenous students' experiences in **"**Understanding Indigenous Learners' Experiences During the First and Second Wave of the COVID-19 Pandemic." This study provides insights about the importance of listening as part of Indigenous online learning experiences.

"Measuring the Impact of an Open Educational Resource and Library e-Resource Adoption Program Using the COUP Framework" is a study from California. **Squibb, Salmon,** and **Yan** applied the cost, outcomes, usage, and perceptions to evaluate a zero-cost course materials program that further confirms OER beneficial cost-savings contributing to student success.

"Student Support in Online Learning—We Need to Talk About Money" by **Simpson** creatively examines how online institutional funding might be used to address student dropout and attrition rates.

Lane and **Stephens** use an historical inquiry to examine the development of online nursing education and purposeful pedagogy in their article, "What It Is and Is Not: Pedagogy in Online Nursing Education Delivery."

"SCOPE of Open Education: A New Framework for Research" expands the theoretical base of open education research. **Clinton-Lisell**, **Roberts-Crews**, and **Gwozdz** propose adding social justice to the currently established components of cost, outcomes, perception, and engagement.

From Iran comes the study, "Integrating Community of Inquiry Framework Principles With Flipped Classroom Pedagogy to Enhance Students' Perceived Presence Sense, Self-Regulated Learning, and Learning Performance in Preservice Teacher Education." **Taghizade**, **Azimi**, **Mahmoudian**, and **Akhash** demonstrate that the COI framework with flipped classroom pedagogy enhances students self-regulated learning and performance.

Yilidirim, **Ilgaz**, **Bayazit**, and **Akçapınar** researched "The Effects of Exam Setting on Students' Test-Taking Behaviors and Performances: Proctored Versus Unproctored." The results support the assessment practices of online courses that have multiple low-stake formative exams.

Biem and **Morrison** researched K-12 online teachers in their study, "Collaboration and Ethics in Distance Learning Design." This study provides insights regarding how online collaborative learning is actualized and barriers to its implementation.

"Development and Validation of the Sense of Online Community Scale" offers a validated scale. With this work, **Shepherd, Bolliger**, and **McKim** have supported other researchers investigating community in online environments in programs and institutions.

Researchers **Zhang**, **Nan**, **Sun**, **Che** and **Kim** from South Korea examined "Teammate Familiarity in Distributed Computer-Supported Collaborative Learning: The Mediating Role of Social Presence." The study found that social media platforms and class webpages were the most widely used channels for supporting student social familiarity.

"Weaknesses in Emergency Remote Teaching in Higher Education Within the Context of the ODL Learning Component in Turkey" continues to explore findings from the global pandemic. **Genç** and **Kesim** found that ERT has weaknesses with respect to teaching method, course structuring, and e-learning materials.

For this issue, there are three Book Reviews. The first reviewer, **Bossu,** examines *Contextualised Open Educational Practices: Towards Student Agency and Self-Directed Learning* edited by Olivier, du Toit-Brits, Blunt, and Dhakulkar. For anyone interested in open educational practices (OEP) in educational settings this 2022 book offers important considerations. The second book, reviewed by **Carr**, entitled *Co-teaching and Co-research in Contexts of Inequality: Using Networked Learning to Connect Africa and the World* edited by Shangase, Gachago, and Ivala highlights the human connection and relationship building to successful co-teaching, co-learning, and co-researching with many of the chapters applying digital

storytelling. The final offering, written by **Ali**, reviews *Blended Learning Environments to Foster Self-Directed Learning* edited by van der Westhuizen, Maphalala, and Bailey. This edited book offers approaches that enhance self-directed learning (SDL) in blended learning environments.

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Educational Technology Undergraduates' Performance in a Distance Learning Course Using Three Courseware Formats

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Abstract

Most educators' inability to provide learning contents that suit different learning styles has caused a lot of problems in terms of performance. Thus, to cater to students' preferences in terms of access to learning contents, the distance learning regulatory body in Nigeria emphasized that course materials should be developed in mixed-media formats. This study was carried out to compare the effects of printed, video, and Moodle-based courseware on educational technology students' achievement, retention, and satisfaction in a distance learning course. A quasi-experimental design was employed for the study involving 108 participants from three experimental groups. The learning content and instruments, subjected to validation and reliability tests, where values of 0.78 and 0.86 were obtained using the Pearson product moment correlation and Cronbach's alpha for achievement and satisfaction inventory, respectively, were administered within a four-week period. Data collected were analyzed using descriptive and inferential statistics. Findings indicated that the printed, video, and Moodle-based courseware formats improved students' achievement with mean gain scores of 47.92, 40.89, and 43.03, respectively. A significant difference was observed in the achievement ($F_{(2,104)} = 8.67$, $p < 0.05$), retention ($F_{(2,104)} = 29.406$, $p < 0.05$), and satisfaction scores ($F_{(2,104)} = 5.662$, $p < 0.05$) of the three groups. Open and distance learning administrators in Nigeria are recommended to produce and deploy printed, video, and Moodle-based formats of courseware to meet different students' learning preferences.

Keywords: courseware, distance learning, mixed media, performance, educational technology

Educational Technology Undergraduates' Performance in a Distance Learning Course Using Three Courseware Formats

Technology has brought innovative changes into the education sector in all fields, hence, different student-centered techniques continue to permeate modern classrooms, leading to major breakthroughs (Campillo-Ferrer & Miralles-Martínez, 2021). Technology makes it possible for schools to plan, organize, and implement new instructional approaches and deliver content face to face or from a distance. One of the new pedagogical approaches used to deliver course contents and educational activities is distance learning (Colomo-Magana et al., 2021; Li, 2018).

Distance learning is a form of technology-based education whereby students are separated physically from teachers but are connected through electronic media. The learning interactivity provided by computer technologies to deliver lessons either synchronously or asynchronously in distance learning is higher than that found in the conventional method of teaching (Al-Balas et al., 2020; Al-Mawee & Gharaibeh, 2021). The rapid expansion of the need to provide access to education for everyone regardless of location, distance, and time has led to the proliferation of technology-supported approaches capable of leveraging interactive courseware aimed at meeting individual requirements and learning styles of students. This explains why the duo of teaching and learning continually advances from a class-based, textbook-oriented strategy to a more flexible, anywhere, anytime system supported by technology (Lau & Thomas, 2018).

The term *courseware* combines the words *course* and *ware*; courseware is understood to be computerized learning materials developed by instructional designers involved in open and distance learning (ODL). Courseware is developed for learners to acquire knowledge in a particular subject area; it uses a conversional tone to carry learners along, or it links up with learners through electronic means. Thus, for teaching and learning to be effective in ODL settings, courseware should have a mixed-media format; that is, it should be downloadable as PDF, learning management system (LMS), audio (MP3), and video (DVD, VCD) formats in order to enhance learning (Falode, 2019). To this end, printed, video-based, and Moodle-based formats of courseware were developed and studied in this research.

Printed Courseware in ODL

Printed courseware has been the main orthodox tool for instructional purposes in most distance learning settings. Print materials guide teachers through the instructional process and allow students to learn and practice procedures. In ODL, print materials have become the regulatory compass used to organize learning in order to provide extra resources for students at both home and school. Given their interactive nature, these resources allow students to study at their own pace (Weng & Cox, 2018).

Studies on how print courseware enhances achievement are not straightforward in terms of their conclusions. For example, Hautea-Arendain (2019) studied the comparative effectiveness of print and nonprint reading materials in improving reading comprehension and discovered that students exposed to reading comprehension print materials performed better than those taught using nonprint materials. In a similar study, Sidabutar et al. (2022) compared the effectiveness of digital and printed English-language

texts and discovered that while both formats improved students' achievement, digital text outperformed print text. Utami and Saefudin (2017) looked at the comparative effect of adopting e-learning and printed materials on independent learning and creativity and discovered no significant difference in students' independence or creativity whether they were exposed to e-learning or printed formats. Conversely, when Whelan (2020) compared the effectiveness of digital and print media on students' performance in a fourth-grade class, he reported a significant difference in the scores of the two groups that favored digital media. Finally, Ziegler (2019) studied the effects on comprehension when students read digital text versus printed text and discovered that students performed better when exposed to print materials over digital.

While print appears to be a good format to present educational contents, using printed materials alone in distance learning may not appeal to learners' various human senses, compared with video-based courseware, for example, hence limiting the capacity of printed materials to cater to different learning styles.

Video-Enhanced Learning in ODL

Video courseware serves as an audio–visual learning medium that offers a real-world examples of learning contents with detailed contextual reality. Videos used for educational purposes help to break down difficult concepts. Thus, videos are effective tools for fostering self-paced learning (Colasante & Douglas, 2016; Khoo et al., 2020). Educational videos are increasingly used to replace face-to-face lectures due to their ability to appeal to both auditory and visual senses, as well as their pervasive availability (Foster et al., 2022). With this type of courseware, students are also offered ample time and opportunity to watch the educational videos as many times as they feel necessary and at their preferred pace, place, and time (Coyne et al., 2018). Furthermore, videos enable learners to understand and digest complex contents, and they also provide an avenue for learners to see concepts from different viewpoints. In line with global best practices, students need the best mixed-media formats to cater to their needs.

Studies on video courseware usage have come to various conclusions. Donkor (2010) compared the effectiveness of print versus video courseware and found the two platforms to be equivalent in their effectiveness. Dikshit et al. (2013) studied the effectiveness of print, interactive multimedia, and online resources and discovered that the use of interactive multimedia CD-ROMs was more effective than print and online materials. Foster et al. (2021) reported that students had better achievement and retention when exposed to video courseware in a flipped classroom setting. Bawa et al. (2021) researched the effectiveness of a video-based instructional package on biology students' achievement and reported that video improved students' achievement.

In light of these studies, more research is required to complement the limitations ingrained in video courseware. Research should include extending the video courseware to an online learning medium with additional interactive features to allow students to interact textually and visually. One such online learning medium that supports different interactive features is Moodle.

Moodle-Based Online Learning in Education

Moodle is used to create online courseware that provides opportunities for interaction and communication between students and teachers (Gudkova et al., 2021). As a popular LMS, Moodle allows students to be more flexible and self-scheduled in their learning, which promotes their independence and increases achievement (Mlotshwa et al., 2020). Likewise, Moodle provides students with various learning materials and tools, including videos and e-text, that arouse interest and understanding of complex information (Chen et al., 2022). Interactive courseware tools provided by Moodle such as email, forum posts, virtual meeting rooms, and chat rooms enhance communication between students and teachers.

Studies on online-based learning are still emerging, thereby giving rise to different LMSs. Most studies have divergent conclusions, depending on the media and circumstances deployed. For example, some studies (Dooley et al., 2018; Green et al., 2018; Morton et al., 2016; Riddle & Gier, 2019) revealed online learning to be highly satisfying and that students achieved better results than from conventional learning. Other studies showed no difference in terms of students' satisfaction (Pickering & Swinnerton, 2019). Falode et al. (2019) looked at the effectiveness of Moodle and WizIQ toward enhancing students' achievement in educational technology concepts, and their findings revealed no significant difference in the effectiveness of the two platforms. In the same vein, when compared with the lecture method, Moodle was found to enhance the learning achievement of undergraduate agricultural science students in North-Central Nigeria (Sobowale et al., 2019). Similarly, Agustina et al. (2020) studied whether Moodle improved students' achievement in reading and writing and discovered it improved students' writing skills more than their reading skills. Bupo (2019) investigated the effect of teaching financial accounting using Moodle and reported that the students achieved and retained the information more after exposure to Moodle Tukura et al. (2020) examined the effectiveness of e-learning on basic science and technology students' achievement and retention; they found that the students performed better in their achievement and retention after exposure to an online e-learning instruction. Chen et al. (2022) researched the effectiveness of Moodle-based e-learning on e-collaborative learning, perceived satisfaction, and study achievement among nursing students and discovered a significant difference in achievement in favor of Moodle. Going further, Arifin (2020) studied the effect of blended learning with Moodle on students' writing achievement, and findings revealed that blended learning with Moodle was more effective than the conventional approach. Thus, the self-paced, mixed-media formats provided in distance education settings, with different learning preferences catered to, appear to enhance students' achievement, retention, and satisfaction.

Achievement is educationally translated into students' performance after having been instructed. That is, it is a scale that reveals students' degree of performance and accomplishment of a specific task at the end of the instructional engagement (Kayii & Dambo, 2019). *Retention*, on the other hand, is an individual's ability to store what has been learned and to recall what has been stored thereafter. Generally, satisfaction is the feeling of difference between prior expectations and perceived achievement. In terms of learning using online-based e-learning technology, the most important factor to have a positive effect on learning satisfaction is the learner's actual performance (Nagy, 2018). Specifically, *online learning satisfaction* refers to learners' evaluation of, opinions about, feelings about, and experiences toward the quality of online learning service provided by online learning providers. It is a cumulative psychological response to online learning contents and the learning environment formed after a rational and emotional comparison between the actual perceived online learning effect and students' perception (Yu, 2022). Ideally, in any form of

online ODL education, students' satisfaction is one of the most important indicators for evaluating the quality of a learning environment. Supporting this idea, AbdulRahman et al. (2015) stated that students' satisfaction, in terms of their expectations being realized, is one of the most critical factors for evaluating the success of any online-based education and resultant performance.

In light of the foregoing discussion, several studies were conducted to ascertain the satisfaction of students in online-based learning. Choe et al. (2019) ascertained students' satisfaction and learning outcomes in asynchronous online lecture videos and discovered that combining different media in a multimedia learning format is highly satisfying; students were highly satisfied with various videos used because they catered to different learning styles. Also, Nagy (2018) evaluated online video usage and learning satisfaction using the technology acceptance model and discovered that online learning has many significant effects on learning and the satisfaction of learners. Additionally, some studies (Dooley et al., 2018; Green et al., 2018; Riddle & Gier, 2019) reported that online learning was highly satisfying, and learners also achieved better learning outcomes through online learning than conventional learning. However, in contrast with the aforementioned studies, Pickering and Swinnerton (2019) found no difference in terms of online satisfaction. Hence, more studies need to be conducted to close these gaps.

Statement of the Problem

Despite the technological advancements that have unanimously simplified learning and allowed for catering toward different learning styles, most ODL instructional designers in Nigeria have not leveraged the opportunities offered by technology to enhance learning. Whenever students' profiles are gathered during enrollment, many learners state their preferences regarding the courseware formats, but ODL instructors in Nigeria do not give special attention to those learning preferences by providing different mixed-media formats, and this affects students' performance. Many studies were carried out to improve students' performance using different technology-supported courseware formats, but very few studies have been conducted in Nigeria or by educational technology experts. Also, most studies have not deployed mixed-media formats. To ameliorate this problem, the effectiveness of using more than one type of courseware during engagement must be examined, in line with the acceptable standards of using various mixed-media formats. This study was therefore carried out to determine whether students' learning outcomes would be enhanced when optional media formats were deployed to teach educational technology students a distance learning course.

Purpose of the Study

The study sought to do the following:

1. Determine the effects of printed, video, and Moodle-based courseware on students' academic achievement in an undergraduate educational technology distance learning course.

2. Ascertain the effects of printed, video, and Moodle-based courseware on students' learning retention in an undergraduate educational technology distance learning course.

3. Find out the differences in students' satisfaction with printed, video, and Moodle-based courseware in an undergraduate educational technology distance learning course.

Research Questions

The following research questions were answered in the study:

1. What are the effects of printed, video, and Moodle-based courseware on students' academic achievement in an undergraduate educational technology distance learning course?

2. What are the effects of printed, video, and Moodle-based courseware on students' learning retention in an undergraduate educational technology distance learning course?

3. What are the differences in students' satisfaction levels when they are exposed to printed, video, and Moodle-based courseware in an undergraduate distance learning course?

Research Hypotheses

The following null hypotheses were tested:

HO_1: There is no significant difference in the achievement scores of students exposed to printed, video, and Moodle-based courseware in an undergraduate educational technology distance learning course.

HO_2: There is no significant difference in the retention scores of students exposed to printed, video, and Moodle-based courseware in an undergraduate educational technology distance learning course.

HO_3: There is no significant difference in students' satisfaction when they are exposed to printed, video, and Moodle-based courseware in an undergraduate educational technology distance learning course.

Methodology

The study adopted a pretest, posttest, non-randomized, quasi-experimental design. The research design layout is presented in Table 1.

Table 1

Research Design Layout

Group	Pretest	Treatment	Posttest	Retention	Satisfaction
Print courseware	O_1	X_I	O_2	O_3	O_4
Video courseware	O_1	X_2	O_2	O_3	O_4
Moodle-based courseware	O_1	X_3	O_2	O_3	O_4

Note. O_1 = pretest for experimental groups 1, 2, and 3; X_I, X_2, and X_3 = treatment for experimental groups 1, 2, and 3; O_2 = posttest for experimental groups 1, 2, and 3; O_3 = retention for experimental groups 1, 2, and 3; O_4 = satisfaction for experimental groups 1, 2, and 3.

The study population consisted of all undergraduate educational technology students at the Federal University of Technology Minna, Nigeria, during the 2021–2022 academic session. The target population comprised all 170 second-year educational technology students. A total of 108 students who were offered a distance learning course (EDT 215: Distance Education) from five teaching options (Biology Education, Chemistry Education, Physics Education, Mathematics Education, and Geography Education) drawn from intact classes were purposively used as the sample. Simple random sampling was used to select three teaching options from the five. Thereafter, the selected options were randomly assigned to the three experimental groups. Students in the three groups received either printed, video, or Moodle-based courseware.

Two instruments were used in the study: treatment instruments and test instruments. The treatment instruments were the printed, video, and Moodle-based courseware. The distance learning course contents treated in the courseware were arranged in six study units, covering the concepts of distance learning, modes of tutoring, procedure for courseware development, mode of assessment in distance learning, team approach in courseware development, and learner support service in distance learning. The test instruments were the achievement test and the satisfaction inventory. The achievement test was made up of 50 multiple-choice questions drawn from the course contents. The satisfaction inventory consisted of 15 items rated on a five-point Likert scale. The total points obtained by each participant in the inventory were converted to an interval scale (percentage).

The treatment instruments were validated by two educational technology experts, two computer science experts, two media production specialists, two instructional designers, one graphic artist, and one language editor, and their observations were infused before the pilot study. A single-shot pilot test was administered with 20 randomly selected students using a split-half method, where a coefficient value of 0.78 was obtained using the Pearson product moment correlation. The satisfaction inventory was administered to the same students in a single-shot test, and a figure of 0.86 was obtained using Cronbach's alpha.

All the three experimental groups were subjected to four-week treatment period. The students in experimental group 1 were given the printed courseware, those in the experimental group 2 were given the video version of the courseware, and students in experimental group 3 learned the course through Moodle. To test achievement, students took a pretest, posttest, and retention test; the retention test was

administered two weeks after the posttest. The satisfaction inventory was administered during the posttest to determine which of the courseware formats the students were more satisfied with. Descriptive statistics were used to answer the research questions while inferential statistics involving ANCOVA, ANOVA, and Šidàk and Scheffé post hoc tests were used to test the null hypotheses at a .05 level of significance.

Results

Research Question 1

What are the effects of printed, video and Moodle-based courseware on students' achievement scores in undergraduate educational technology distance learning course?

Table 2 shows the mean and standard deviation of the pretest and posttest scores of students exposed to printed, video, and Moodle-based courseware formats.

Table 2

Pretest and Posttest Scores of Students Exposed to Print, Video, and Moodle-Based Courseware Formats

Group	*N*	Pretest *M* (*SD*)	Posttest *M* (*SD*)	*M* gain
Print	35	23.17 (5.27)	71.09 (5.62)	47.92
Video	36	22.50 (7.06)	65.39 (6.64)	40.89
Moodle	37	23.11 (5.50)	66.14 (6.50)	43.03

Students exposed to printed courseware had a mean of 23.17 and a standard deviation of 5.27 at pretest, and a mean score of 71.09 and a standard deviation of 5.62 at posttest. The mean difference between the pretest and posttest scores of the students exposed to print courseware was 47.92. The students exposed to video courseware had a mean of 22.50 and a standard deviation of 7.06 in the pretest, and a mean score of 65.39 and a standard deviation of 6.64 in the posttest. The mean difference between the pretest and posttest scores of the students exposed to video courseware was 40.89. Similarly, the students exposed to Moodle-based courseware had a mean of 23.11 and a standard deviation of 5.50 in the pretest, and a mean score of 66.14 and a standard deviation of 6.50 in the posttest. The mean difference between the pretest and posttest scores of the students exposed to Moodle-based courseware was 43.03. Thus, the trio of printed, video, and Moodle-based courseware formats improved students' achievement. However, the students exposed to printed courseware achieved better, with the highest mean gain of 47.92.

Research Question 2

What are the effects of printed, video, and Moodle-based courseware on students' academic retention scores in undergraduate educational technology distance learning course?

Table 3 shows the mean and standard deviation of the posttest and retention scores of students exposed to printed, video, and Moodle-based courseware formats.

Table 3

Posttest and Retention Scores of Students Exposed to Print, Video, and Moodle-Based Courseware Formats

Group	*N*	Posttest *M* (*SD*)	Retention *M* (*SD*)	*M* difference
Print	35	71.09 (5.62)	66.34 (5.15)	4.75
Video	36	65.39 (6.64)	63.58 (6.46)	0.19
Moodle	37	66.14 (6.50)	59.95 (5.38)	6.19

The students exposed to printed courseware had a mean of 71.09 and a standard deviation of 5.62 at posttest, and a mean score of 66.34 and a standard deviation of 5.15 at the retention test. The mean difference between the retention and posttest scores of the students exposed to printed courseware was 4.75. The students exposed to video courseware had a mean of 65.39 and a standard deviation of 6.64 in the posttest, and a mean score of 63.58 and a standard deviation of 6.46 in the retention test. The mean difference between the retention and posttest scores of the students exposed to video courseware was 0.19. Similarly, the students exposed to Moodle-based courseware had a mean of 66.14 and a standard deviation of 6.50 in the posttest, and a mean score of 59.95 and a standard deviation of 5.38 in the retention test. The mean difference between students' posttest and retention scores for Moodle-based courseware was 6.19. Thus, the use of printed, video, and Moodle-based courseware formats all improved students' learning retention. However, students exposed to video-based courseware had better learning retention, with the lowest mean difference of 0.19.

Research Question 3

What are the differences in the satisfaction levels of students in learning undergraduate educational technology distance learning course through printed, video, and Moodle-based courseware?

Table 4 shows the mean and standard deviation of students' satisfaction after being exposed to printed, video, and Moodle-based courseware formats.

Table 4

Students' Satisfaction with Print, Video, and Moodle-Based Courseware Formats

Group	*N*	*M*	*SD*
Print	35	70.74	4.28
Video	36	71.11	4.55
Moodle	37	67.95	4.36

Students exposed to printed courseware had a mean satisfaction score of 70.74 and a standard deviation of 4.28. The students exposed to video courseware had a mean satisfaction score of 71.11 and a standard deviation of 4.55. Similarly, the students exposed to Moodle-based courseware had a mean satisfaction score of 67.95 and a standard deviation of 4.36. This shows that the students were highly satisfied with the various courseware formats used. However, the students exposed to video-based courseware were the most satisfied, with the highest mean satisfaction score of 71.11.

Testing of Null Hypotheses

Hypothesis 1

There was no significant difference in the mean achievement scores of students exposed to printed, video, and Moodle-based courseware in undergraduate educational technology distance learning course.

Table 5a shows the ANCOVA results of students exposed to printed, video, and Moodle-based courseware formats.

Table 5a

Students' Achievement After Exposure to Print, Video, and Moodle-Based Courseware Formats: ANCOVA Results

Source	*SS*	*df*	*MS*	*F*	*p*
Corrected model	702.246	3	234.082	5.911	.001
Intercept	32,394.901	1	32,394.901	817.985	.000
Pretest (covariate)	22.878	1	22.878	0.578	.449
Achievement	687.036	2	343.518	8.674*	.000
Error	4,118.745	104	39.603		
Total	496,761.000	108			

Corrected total	4,820.991	107

* $p \leq .05$.

In the table, $F_{(2,104)} = 8.67$ and $p < .05$. This means that the null hypothesis was rejected, indicating a significant difference in the mean achievement score of students exposed to printed, video, and Moodle-based courseware formats. To determine where the significant difference lies, the Šidàk post hoc test was conducted, as presented in Table 5b.

Table 5b

Students' Achievement Using Printed, Video, and Moodle-Based Courseware Formats: Šidàk Post Hoc Test Results

		M difference			95% CI	
(I) Group	(J) Group	(I–J)	*SE*	*p*	Lower	Upper
Print	Video	5.70*	1.491	.001	2.08	9.31
	Moodle	4.95*	1.481	.003	1.36	8.54
Video	Print	−5.70*	1.491	.001	−9.31	−2.08
	Moodle	−0.75	1.470	.942	−4.31	2.82
Moodle	Print	−4.95*	1.481	.003	−8.54	−1.36
	Video	0.75	1.470	.942	−2.82	4.31

* $p \leq .05$.

There was a significant difference in achievement between students exposed to printed and students exposed to video courseware formats. There was also a significant difference in achievement between students exposed to video and students exposed to printed courseware formats.

Hypothesis 2

There is no significant difference in the mean retention scores of students exposed to printed, video, and Moodle-based courseware in undergraduate educational technology distance learning course.

Table 6a shows the ANCOVA result of students' retention when exposed to printed, video, and Moodle-based courseware formats.

Table 6a

Students' Retention Scores When Exposed to Print, Video, and Moodle-Based Courseware Formats: ANCOVA Results

Source	*SS*	*df*	*MS*	*F*	*p*
Corrected model	3,561.967	3	1,187.322	210.991	.000
Intercept	51.588	1	51.588	9.167	.003

Posttest (covariate)	2,819.282	1	2,819.282	500.995	.000
Retention	330.953	2	165.477	29.406*	.000
Error	585.246	104	5.627		
Total	435,955.000	108			
Corrected total	4,147.213	107			

* $p \leq .05$.

In the table, $F_{(2,104)} = 29.40$, and $p < .05$. This means the null hypothesis was rejected, indicating a significant difference in the retention scores of students exposed to printed, video, and Moodle-based courseware formats. To determine where the significant difference lies in the retention scores of the students across the various groups, the Šidàk post hoc test was conducted, as shown in Table 6b.

Table 6b

Students' Retention When Exposed to Print, Video, and Moodle-Based Courseware Formats: Šidàk Post Hoc Test Results

		Mean difference			95% CI	
(I) Group	(J) Group	(I–J)	*SE*	*p*	Lower	Upper
Print	Video	2.76	1.352	.125	−0.52	6.04
	Moodle	6.40*	1.343	.000	3.14	9.65
Video	Print	−2.76	1.352	.125	−6.04	0.52
	Moodle	3.64*	1.333	.022	0.40	6.87
Moodle	Print	−6.40*	1.343	.000	−9.65	−3.14
	Video	−3.64*	1.333	.022	−6.87	−0.40

* $p \leq .05$.

A significant difference was observed in the retention score of students exposed to printed and Moodle-based courseware formats. Also, a significant difference was observed between the retention score of students exposed to video and Moodle-based courseware formats.

Hypothesis 3

There is no significant difference in the mean responses of students' satisfaction level when exposed to undergraduate educational technology distance learning course through printed, video, and Moodle-based courseware.

Table 7a shows the ANOVA result of the satisfaction of students exposed to printed, video, and Moodle-based courseware formats.

Table 7a

Satisfaction of Students Exposed to Print, Video, and Moodle-Based Courseware Formats: ANOVA Results

Source	*SS*	*df*	*MS*	*F*	*p*
Between groups	218.941	2	109.470	5.662*	.001
Within groups	2,030.133	105	19.335		
Total	2,249.074	107			

* $p \leq .05$.

In the table, $F_{(2,\ 105)} = 5.662$, and $p < .05$. This means the null hypothesis was rejected, indicating a significant difference in the satisfaction of students exposed to printed, video, and Moodle-based courseware. The students were highly satisfied while using the various courseware formats. To determine where the significant difference lies, the Scheffé post hoc test was conducted, as presented in Table 7b.

Table 7b

Students' Satisfaction with Print, Video, and Moodle-Based Courseware Formats: Scheffé Post Hoc Test Results

		M difference			95% CI	
(I) Group	(J) Group	(I–J)	*SE*	*p*	Lower	Upper
Print	Video	−0.368	1.044	.979	−2.90	2.16
	Moodle	2.797*	1.037	.024	0.28	5.31
Video	Print	0.368	1.044	.979	−2.16	2.90
	Moodle	3.165*	1.029	.008	0.67	5.66
Moodle	Print	−2.797*	1.037	.024	−5.31	−0.28
	Video	−3.165*	1.029	.008	−5.66	−0.67

* $p \leq .05$.

A significant difference was found between the satisfaction of students exposed to printed and Moodle-based courseware formats. Also, a significant difference was observed between the satisfaction of students exposed to video and Moodle-based courseware formats.

Discussion

The finding of Hypothesis 1 shows the existence of a significant difference in the achievement of students exposed to printed, video, and Moodle-based courseware. The finding indicates that while all students, whether taught using printed, video, and Moodle-based versions of the courseware, had improved performance after the treatment, students taught with printed courseware particularly achieved better.

Students find printed courseware handy; they can make notations and highlight sections as they study, leading to better cognitive mapping. This finding is in agreement with those of Hautea-Arendain (2019), who found a significant difference in the achievement of students exposed to print and other courseware formats. It also tallies with results found by Ziegler (2019), whose study on the effect of reading digital text versus printed text in comprehension revealed that students performed better when exposed to printed materials compared with digital materials. This finding equally agrees with those of Dikshit et al. (2013), who researched the effectiveness of print, interactive multimedia, and online resources and discovered a significant difference among the three groups. But the use of interactive multimedia through a CD-ROM was more effective than print and face-to-face support that was presented online. Conversely, our finding disagrees with Sidabutar et al. (2022), who compared the effectiveness of digital and printed texts in English and discovered that students using digital text outperformed students using in print text. Additionally, Whelan (2020) compared the effectiveness of digital and print media on students' performance and reported a significant difference in the scores of the two groups in favor of digital media. Similarly, this finding is not in tandem with that of Donkor (2010), who checked the comparative effectiveness of print versus video courseware and discovered no significant difference between the two platforms because they were equivalent in their effectiveness. Also, the finding disagrees with that of Utami and Saefudin (2017), who looked at the comparative effectiveness of adopting e-learning and printed materials on independent learning and creativity and discovered no significant difference in independence and creativity of the students exposed to e-learning and printed formats. The finding also disagrees with the findings of Falode et al. (2019), who studied the effectiveness of Moodle and WizIQ toward enhancing students' achievement and found no significant difference in the effectiveness of the two platforms.

The result of Hypothesis 2 shows the existence of a significant difference in the retention scores of students exposed to printed, video, and Moodle-based courseware. This shows that while students who were taught using printed, video, and Moodle-based courseware were able to retain the concepts they learned, the students taught with video-based courseware showed higher rates of retention. This finding is connected to the fact that using video-based courseware simultaneously appeals to students' visual and auditory senses: they can see, pause or rewind, and watch and listen to contents. Students retain concepts better when they can see and hear what is taught. This finding agrees with Bupo's (2019) finding that a significant difference exists in the retention of students exposed to the Moodle platform and other media formats. The finding also agrees with Falode et al.'s (2019) findings, which revealed no significant difference in students' retention of educational technology concepts in favor of Moodle. Similarly, this finding is in agreement with that of Tukura et al. (2020), who recorded a significant difference in the retention scores of the students exposed to an online e-learning instruction using different formats. This finding also agrees with that of Foster et al. (2021), who reported that students had higher learning retention when exposed to video courseware format.

The result of Hypothesis 3 shows the existence of a significant difference in the satisfaction of students exposed to printed, video, and Moodle-based courseware formats. The students in all three groups were all satisfied with their format (printed, video, or Moodle). However, the students taught with video courseware were more satisfied. This finding could be due to the fact that using video courseware format was more enjoyable as students could see and hear at the same time. Video courseware is flexible and has the capacity to combine entertainment with education. This will surely increase learning satisfaction because learning

when more than one sense is involved caters to students' different learning preferences. This finding agrees with that of Choe et al. (2019), who studied students' satisfaction and learning outcomes in asynchronous online lecture videos and discovered that combining different media in a multimedia learning format is highly satisfying. This finding is also in agreement with that of Nagy (2018), who evaluated online video usage and learning satisfaction using the technology acceptance model and discovered that online learning has a significant effect on learning and satisfaction. Also, our finding is in conformity with those recorded in the studies of Dooley et al. (2018), Green et al. (2018), and Riddle and Gier (2019), all of whom reported that learning through different online courseware was highly satisfying for students and also that learners using online courseware achieved better learning outcomes than those taught using conventional methods. However, it disagrees with the findings of Pickering and Swinnerton (2019), whose study showed no significant difference in terms of students' satisfaction when learning with different course formats.

Conclusion and Implication

The findings of this study revealed that printed, video, and Moodle-based courseware formats all have the possibilities of catering to different learning preferences of students given that all students had high achievement and retention and equally found their courseware formats very satisfactory. The implication of these findings is that ODL experts and distance learning policy makers in Nigeria have a viable reason to incorporate different mixed-media formats, including printed, video, and Moodle-based courseware, in education to meet the different learning preferences of students, thus enhancing learning outcomes. When printed, video, and Moodle-based courseware formats are available for students to choose from, the problem of students' lack of interest in academic endeavors and poor academic performance will be lessened because learning will be self-paced, flexible, learner-centered, and satisfactory.

Recommendations

Based on the finding of this study, the authors make the following recommendation: ODL administrators and experts in Nigeria should liaise with educational technology experts, instructional designers, and education policy makers to design, develop, implement, and incorporate print, video, and Moodle-based courseware into distance learning program curriculum in order to meet the learning preferences of different students so as to enhance learning outcomes.

Limitation and Suggestion for Further Study

The study was limited to one geographical location in Nigeria, and the population used in the study was restricted to students in one particular location; thus, the authors cannot make generalizations about the findings. It is hereby suggested that similar studies should be conducted across various locations in Nigeria using a much larger population.

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On the Ethical Issues Posed by the Exploitation of Users' Data in MOOC Platforms: Capturing Learners' Perspectives

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Abstract

Due notably to the emergence of massive open online courses (MOOCs), stakeholders in online education have amassed extensive databases on learners throughout the past decade. Administrators of online course platforms, for instance, possess a broad spectrum of information about their users. This information spans from users' areas of interest to their learning habits, all of which is deduced from diverse analytics. Such circumstances have sparked intense discussions over the ethical implications and potential risks that databases present. In this article, we delve into an analysis of a survey distributed across three MOOCs with the intention to gain a deeper understanding of learners' viewpoints on the use of their data. We first explore the perception of features and mechanisms of recommendation systems. Subsequently, we examine the issue of data transmission to third parties, particularly potential recruiters interested in applicants' performance records on course platforms. Our findings reveal that younger generations demonstrate less resistance towards the exploitation of their data.

Keywords: learning analytics, massive open online course, MOOC, ethics, recommender systems, data privacy

On the Ethical Issues Posed by the Exploitation of Users' Data in MOOC Platforms: Capturing Learners' Perspectives

Over the past decade, virtual learning environments have been increasingly used in educational settings and, along with them, dashboards whose aim is notably to monitor users' activity. This evolution has triggered vivid debates worldwide over the ethical questions raised by the use of learning analytics (LA), whose potential applications have been widely documented (Ifenthaler, 2017; Ifenthaler & Tracey, 2016). Pardo and Siemens (2014) listed the privacy issues that needed to be considered during the design of LA-based research projects if learners were to "make rational, informed choices regarding consent to having their data collected, analysed, and used" (p. 438). Prinsloo and Slade (2015, 2017, 2018) highlighted the importance of students' self-management of analytics.

To address these issues, Jisc, a charitable organization that champions the use of digital technologies in the UK, developed a *Code of Practice for Learning Analytics* (Jisc, 2015; Sclater, 2016), which discusses a taxonomy of issues and necessary governance structures. An Australian study by West et al. (2016) collected views from key academic stakeholders, from professors to institutional leaders, to develop a decision-making framework aimed at fostering transparent institutional policies and broader ethical literacy.

The rise of massive open online courses (MOOCs) in the early 2010s led to a sharp increase in publications on the use of LA on an unprecedented scale. Early studies dealt with hundreds of thousands of learners (Breslow, 2013; Ho et al., 2014), and there continues to be a stream of research focusing, in some cases, on the behaviour of millions of registrants worldwide (Kizilcec et al., 2017; Wintermute et al., 2021), raising numerous ethical issues (Marshall, 2014).

As MOOC designers, we took the opportunity to investigate some of these issues through a survey consisting of closed questions, which was broadcast in three different online courses that started in 2021. We employed a self-selection sampling strategy. The large audiences of these courses enabled us to gather a significant number of responses, and respondents were likely prone to consider the issue of data privacy because all of their actions were being logged by the hosting platform. We investigated two emblematic data-related use cases in MOOCs: recommender systems and the transmission of data to third parties. The first represents a typical service aimed at improving user experience, while the latter involves the monetization of user data. In the next paragraphs, we expose some of the reasons why these problems are significant in the context of MOOCs.

The need for user oversight of LA has become increasingly pressing with the rise of artificial intelligence in online learning (Hsu et al., 2022), and the increasing use of adaptive systems with personalization (Hwang et al., 2022). As underscored in our previous publication focused on MOOC catalogues, the diversity of the offer has increased sharply during the 2010s (Cisel, 2019), increasing the need for dedicated recommender systems. In some online course platforms such as DataCamp (Baumer et al., 2020), users are even provided with a list of course and resource suggestions after an automated assessment in order to improve their score over time.

A few publications have delved into the issue of recommender systems in the context of MOOCs: "With MOOCs[’] proliferation, learners will be exposed to various challenges and the traditional problem in TEL [technology enhanced learning], finding the best learning resources, is more than ever up to date" (Bousbahi & Chorfi, 2015, p. 1813).

As the audience of MOOC platforms grows, associated recommendation algorithms may influence at large scales the topics that users choose to pursue. This could lead to gradual homogenization of learning projects (Tough, 1971) across the landscape of online education, and one should not underestimate the potential long-term impacts of these recommender systems. While these long-term dynamics should not be overlooked, learners may be more immediately concerned with what happens to the data fed into these algorithms, particularly with regard to potential data leaks. Due to privacy concerns, researchers working with MOOC data have developed frameworks to ensure the protection of users' anonymity (Hutt et al., 2022). It is worth exploring learners' perspectives on the exploitation of information even for services like recommender systems, which were designed to improve the user experience. This becomes even more important if this information is monetized through interactions with third parties (Ferguson, 2019).

Selwyn (2019, p.11) highlighted the risk that profit-led projects posed to public education in the "burgeoning data economy." He advocates that learners should have a greater oversight on their LA, a topic that gained increasing importance with the implementation of the General Data Protection Regulation (Presthus & Sørum, 2019). With regard to MOOCs, employers may express skepticism about the value of MOOC certificates (Radford et al., 2014), particularly because not all classes are career relevant (Kizilcec & Schneider, 2015). Employers might therefore show more interest in other types of data generated by these courses (Allal-Chérif et al., 2021).

If we adopt a strict definition of MOOCs—online classes with free registration and open access to most course material (Daniel, 2012)—concerns about the monetization of learners' data are heightened by the complexity of MOOCs' business models (Porter, 2015). During the early stages of the MOOC movement, authors demonstrated that these courses were costly to design and broadcast (Hollands & Tirthali, 2014) and that income from selling certificates rarely covered design costs (Burd et al., 2015). While it was argued that these classes did not necessarily need to be economically sustainable as they were used in part as advertisement tools by academic institutions (Kolowich, 2013), it remains likely that various stakeholders, especially hosting platforms like Coursera, will seek to diversify their income sources (Burd et al., 2015). It is therefore relevant to explore learners' reactions to the monetization of their data, particularly if it involves sharing it with third parties like recruiters, and to understand how different groups of learners may respond to varying business models. This latter issue drove us to incorporate sociodemographic variables in our analysis.

Sociologists have repeatedly proven the importance of age when it came to individuals' perspectives on information privacy (Regan et al., 2013). Miltgen and Peyrat-Guillard (2014, p. 107), for instance, underscored the influence of age in an influential empirical research study: "In addition to culture, age dictates how people relate to IT, a phenomenon that influences their privacy concerns." A generational shift in the concern over data privacy could trigger long-term changes in the acceptability of a diverse range of uses of LA; while the respondents' ages were collected in most of the aforementioned quantitative studies, this information has not been exploited to understand the data. These diverse considerations led us to investigate a set of research questions, three of which are presented in this article:

RQ1: What are learners' perspectives on the exploitation of MOOC data to feed recommender systems, and how much do their opinions depend upon the goal of the recommendation?

RQ2: What are learners' perspectives on the transmission of MOOC data to third parties (recruiters, etc.)?

RQ3: To what extent does the age of learners affect their perspective on the use of their data?

Based on the findings of Miltgen and Peyrat-Guillard (2014), we hypothesized that younger users were more open to the use of their data.

Privacy Concerns and the Calculus Framework

The scholarly exploration across the field of management information systems (MIS) and other related disciplines inspired Dinev et al. (2013) to develop a comprehensive research model that can prove useful to the interpretation of privacy concerns regarding LA. We relied on this author's work, including literature reviews, as a theoretical framework to interpret our data. Central to this model is the "calculus framework" of privacy, which encapsulates the dynamic interplay between risk and control elements (as per the studies of Culnan & Armstrong, 1999; Dinev & Hart, 2006). This calculus perspective on privacy has been acknowledged for its significant utility in dissecting the pressing privacy issues faced by the contemporary consumer (Culnan & Bies, 2003).

Underpinning this perspective is the concept that privacy is not an absolute term. It implies that there is a certain fluidity to it, shaped by a cost–benefit analysis or, in other words, a "calculus of behavior" (Laufer & Wolfe, 1977, p.22). Such a notion draws a nuanced portrait of privacy, showcasing it as a concept that extends beyond the simplistic binary of private or public. To strengthen this core concept of privacy, Dinev et al. (2013) has interwoven it with modern theories of control and risk. These theories strive to elucidate the process by which individuals formulate their perceptions of risk and control regarding their personal information.

The extent of privacy concerns that an individual harbours has been demonstrated to influence their decisions about revealing personal information. Personal data and the concept of privacy risk play vital roles in this process. Additionally, the calculus framework of overall privacy (as highlighted by Dinev & Hart, 2004, 2006) further emphasizes the risk–control interplay.

Interestingly, both risk and control are seen to function as privacy-driven beliefs linked to the possible repercussions of data disclosure, raising questions about the perceived risks of a disclosure of LA data. Therefore, based on this extensive literary exploration, Dinev and Hart pinpoint the two primary factors that contribute to the perception of privacy: the control perceived over one's information and the perceived risk associated with it.

This calculus perspective on privacy, hailed for its utility in analysing modern consumer privacy concerns (Culnan & Bies, 2003), reiterates the understanding that privacy is not a fixed construct. As advocated by Klopfer & Rubenstein (1977), it is a fluid concept, subject to a cost–benefit analysis and, thus, forms a part of the "calculus of behavior" (Laufer & Wolfe, 1977).

These identified components—perceived control and perceived risk—are then integrated into Dinev et al.'s (2013) model. The author proposes that the risk an individual perceives is influenced by a combination of factors. These include the expected outcomes from sharing their information, the sensitivity of the information, the importance placed on transparency about the information, and the legal expectations tied to regulations.

Delving deeper into the model, the privacy calculus concept suggests that individuals weigh costs against benefits in their privacy decisions. This trade-off scenario is assumed to be a vital aspect when an individual is considering sharing personal information with service providers or businesses. This is because, according to the calculus perspective of privacy, consumers carry out a cost–benefit analysis when asked to provide personal data (Culnan, 1993; Dinev & Hart, 2006; Milne & Gordon, 1993).

This decision-making behaviour is driven by an individual's aim to achieve the most positive net outcome, as highlighted by Stone and Stone (1990). Overall, Dinev et al. (2013) extends the calculus perspective on privacy by incorporating it with an understanding of how contextual (information sensitivity), organizational (transparency importance), and legal (regulatory expectations) influences shape an individual's perceived risk. They further propose that this blend of influences collectively determines an individual's decision on information disclosure, whether it be LA for a recommender system or grades in a MOOC for a potential recruiter.

Methods

In this section, we initially present different authors' approaches to the ethics of data use in online education, and then position our work within this expanding literature. We then delve into the data collection tool—MOOCs—and discuss Likert scale–based items. We finally describe the respondents' characteristics.

Information Ethics: An Empirical Approach

Although many ethical issues raised by the increasing use of LA have been mapped through literature reviews (Cerratto Pargman & McGrath, 2021; Tzimas & Demetriadis, 2021) and specific articles, the majority of contributions are conceptual, especially from the perspective of information ethics (Rubel & Jones, 2016). In a literature review, Hakimi et al. (2021) listed only 14 empirical papers or case studies out of the 77 publications about the ethical concerns raised by LA that they considered, therefore highlighting the need for more data collection on the topic. The articles published by Schumacher and Ifenthaler (2018) and Jones et al. (2020) well illustrate a qualitative approach to exploring learners' perspectives. Both articles feature qualitative studies on students' expectations about how their analytics would be used.

Our current work belongs to the category of survey-based assessment of learners' perspectives on their analytics, with the aim of understanding how their attitudes vary depending on the proposed purpose of these analytics (Arnold & Sclater, 2017; Viberg et al., 2022; West et al., 2020; Whitelock-Wainwright et al., 2019; Whitelock-Wainwright et al., 2020; Whitelock-Wainwright et al., 2021). Whitelock-Wainwright and colleagues proposed and validated the Student Expectations of Learning Analytics Questionnaire (SELAQ), a comprehensive tool that encompasses common issues and applications of LA in higher education. SELAQ considers three dimensions: expectations of service features,

communalities, and ethical and privacy concerns. "Will the university ask for my consent before my educational data are outsourced for analysis by third-party companies?" is a typical question drawn from the latter category. A significant proportion of items are relevant only in the context of a university. As the survey is targeted towards students, a significant proportion of items are relevant only in a university context; therefore, this research instrument is not applicable to our context. Unlike these authors, our study focuses on a narrower range of possible uses but explores them in greater depth.

Using MOOCs to Circulate Surveys

As argued by Zimmermann et al. (2016), MOOCs are great tools to collect data, notably through surveys. Due to their ability to quickly reach thousands, if not tens of thousands of potential respondents, these courses have been used extensively over the years to carry out survey-based research projects. In some of our previously published research, thanks to collaboration with dozens of MOOC instructors, we gathered more than 8,000 responses, enabling us to obtain statistically robust results (Cisel, 2018). Stephens-Martinez et al. (2014) used MOOCs to gather thousands of responses for a survey aimed at evaluating the mock-up of a dashboard. Learners were required to assess the utility of a set of indicators meant to monitor course activity.

The use of an online course to broadcast a survey on LA is made all the more relevant by the fact that respondents are themselves directly concerned with the question. The mere registration and navigation to the page where the survey is embedded (we located the form within the course itself) generates logs that can thereafter be analysed. Many respondents typically engage in proposed graded activities, which makes questions about the processing of their grades and analytics relevant to them. Self-selection bias is inherent in online surveys (Bethlehem, 2010), but it did not impede comparisons within items or across age categories, as self-selection affected all groups equally.

Data Collection Tool

The MOOC platform France Université Numérique (FUN) was established by the French Ministry of Higher Education in 2014 and has gathered millions of registrations over the years (Cisel, 2019; Wintermute et al., 2021); it requires all instructors, at the beginning of each course, to incorporate a survey of 26 items focusing on users' sociodemographic data and motivations to follow the class. This survey also allows instructors to include a few of their own questions.

We incorporated three items based on the use of LA in the form of 4-point Likert items in three MOOCs launched in 2022: Data and Critical Thinking, An Introduction to Data Science, and Blended Learning in Higher Education. The use of Likert items is a departure from the binary yes/no approaches that were adopted by Arnold & Sclater (2017), for instance. The authors designed items that limited respondents to a binary "yes" or "no" response—for example: "Would you be happy for data on your learning activities to be used if it kept you from dropping out or helped you get personalized interventions?" Likert items introduce more nuance in the responses (Joshi et al., 2015).

Likert Items

The first item laid emphasis on the type of data used by recommendation systems: "If you use a learning platform enough (like FUN MOOC or Coursera), it has a certain amount of data about you: your interests, skills, etc. Technically, this data can be transmitted to a number of stakeholders outside the platform (however, this is not the case for FUN). Out of the following data, what do you think about the fact that they could be transmitted to third parties (potential recruiters, etc.)?". The items listed were:

courses completed, key strengths, grades, areas of interest, learning habits, registrations, and dropped courses.

The second item was on the features of recommender systems: "Imagine you are browsing a MOOC catalogue, like FUN MOOC, and following classes. Within the platform, recommendation algorithms suggest personalized elements (courses, activities, learning partners, etc.) to improve your learning experience. What is your position on the fact that your data are mobilized to provide you with the following recommendations?" Five possibilities were then listed: grades, key strengths, courses completed, areas of interest, and learning habits.

The third item was about the data used by recommender systems: "The more you agree to share data about yourself, the more it is possible to improve the performance of recommendation algorithms (for courses, educational content, etc.). What is your position on sharing the following personal data in order to improve a recommender system?" Seven different types of data were then presented, ranging from courses completed to learning habits.

At the beginning of each question, we reminded the learners that the MOOC platform that hosted the courses did not use their data in any of the ways listed in the items. We wanted the respondents to understand that they were dealing with theoretical situations that did not apply directly to them in their MOOC.

Sample

The three courses were open for an entire year, from November 2021 to November 2022, allowing for continuous collection of surveys as users kept registering. Out of the 3,018 responses received throughout the year, 404 were incomplete, resulting in a total of 2,614 valid responses. Most of them came from the Data and Critical Thinking MOOC (62.5%) (Table 1). The sex ratio was close to 1:1, and 69.8% of respondents lived in France. For further analyses, we segmented age into 10-year intervals, beginning at 16. Learners over 66 years of age were grouped into a single category, representing approximately 10% of respondents. They were, however, excluded for further analyses since most were retired as per French law, and items on transmission of data to third parties like recruiters therefore proved irrelevant.

Table 1

Descriptive Statistics for Relevant Variables Among Respondents (N = 2,614)

Variable	Level	% of respondents
Age (years)	16–25	11.8
	26–35	18.6
	36–45	19.5
	46–55	22.3
	56–65	18.0
	66+	9.9
Gender	Male	51.1
	Female	48.2
	Other	0.6
Country of residence	France	69.8
	Other	30.2
MOOC (origin of responses)	Data and Critical Thinking	62.5
	Data Science and Its Stakes	6.6
	Blended Learning in Higher Education	30.8

Data Analysis

Various strategies exist for designing Likert items. One key dichotomy lies in the choice between even and odd numbers of levels. Researchers commonly favour a 5-point or 7-point scale (Dawes, 2008) when determining their agreement or disagreement with a given option. This approach, however, has been criticized for enabling undecided respondents to default to the median option (Dawes, 2008). An even number of points urges respondents to "pick a side"; hence, it was our chosen method. All three items regarding learners' perspectives on the use of their data were presented in 4-point Likert items.

Statistical analysis of Likert data has followed two distinct approaches over the years. The first involves converting the different scale levels into numbers. For example, the levels *somewhat favourable* and *favourable* might be represented by the numbers 3 and 4, respectively. This method facilitates the use of comprehensive models like linear regression, enabling comparison of the relative influence of independent variables such as gender and age. Conversely, some researchers prefer to treat the Likert item as categorical data. The approach of treating numeric data as if it were categorical has faced criticism for violating the fundamental assumptions of parametric models. Since our main independent variable was age, reducing the necessity for comprehensive models, we opted for the traditional Chi-square approach to Likert data (Croasmun & Ostrom, 2011). Age was categorized to facilitate this analysis. To visualize our results, we used the Likert function from the HH package in R 4.0.

Results

Below, we examine learners' views on recommender systems, concentrating on their attitudes towards various system features and the kind of data used to power them. Next, we present their views on data sharing from online course platforms with third parties, such as recruiters. In both scenarios, we demonstrate the correlation between the learners' age group and their perspectives.

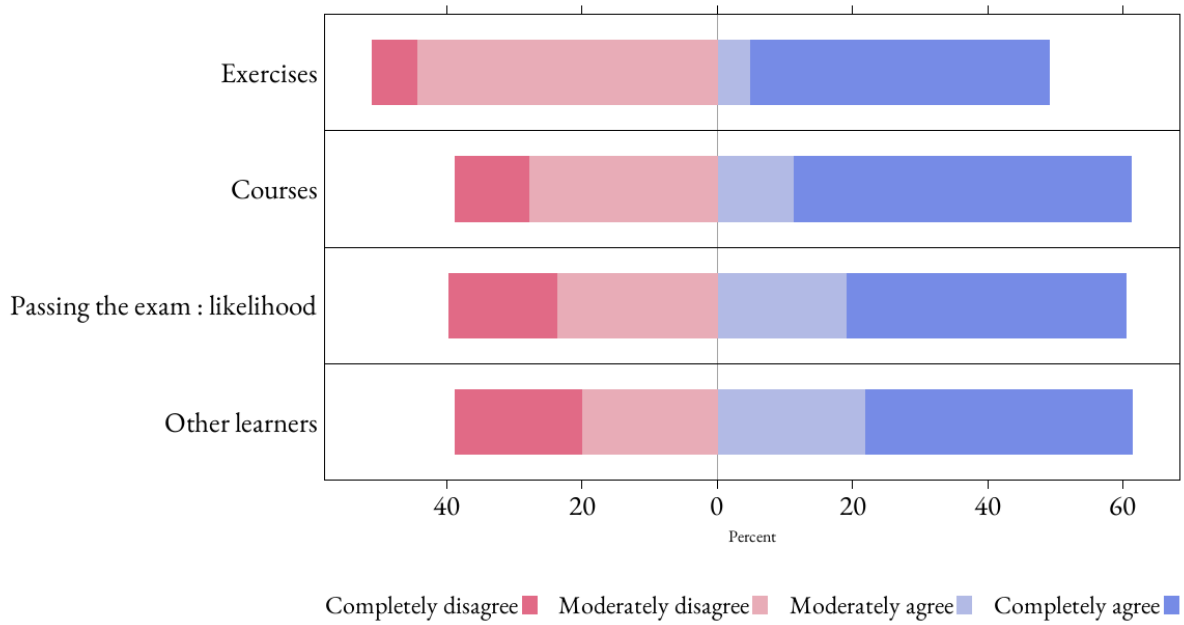
Recommender Systems

Even if there were statistically significant differences across the four items of the survey (X^2 [9, N = 2,614] = 846.03, $p < 2.210^{-16}$), respondents overall had favourable opinions about the use of a recommendation system for the different use cases that we listed. Exercise and course recommendation scored the highest (49.0% and 60.1% agreed, respectively) (Figure 1).

While respondents seemingly had a positive view of the existence of these algorithms in different situations, they "frowned upon" the fact that these algorithms used different types of data to make recommendations (Figure 2). Their position differed significantly depending on the type of data (X^2 [9, N = 2,614] = 130.8, $p < 2.210^{-16}$).

Figure 1

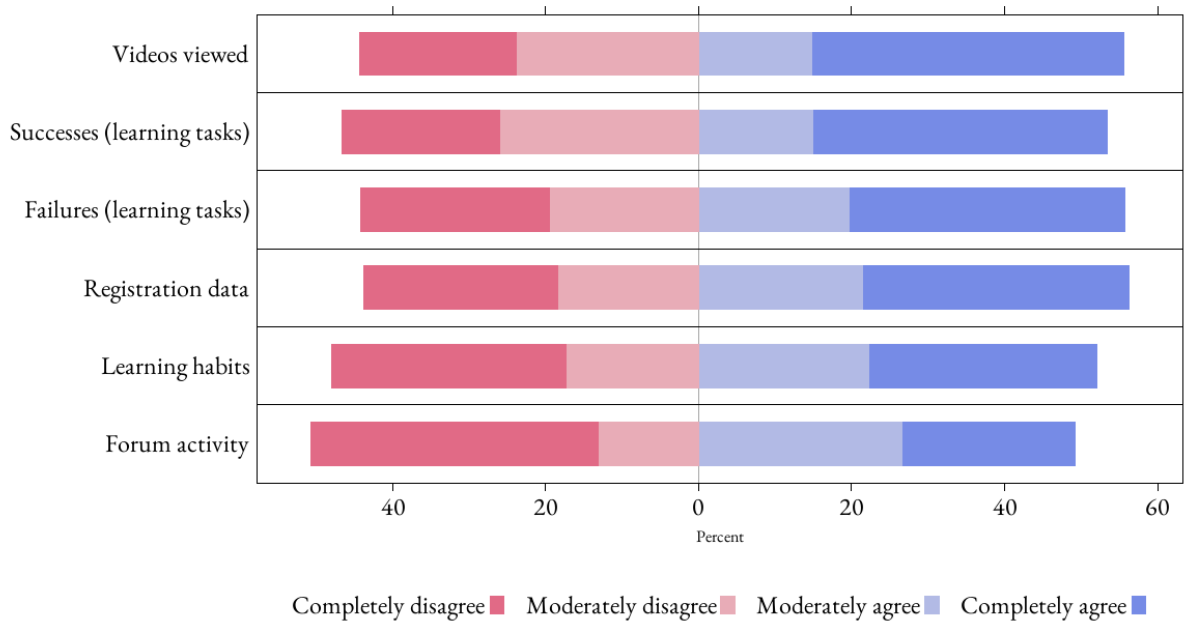
Posture Towards Different Features of the Recommender System (N = 2,614)



The use, in recommender systems, of the IDs of the videos that were viewed was the least controversial (55.6% agreed, and among them 40.7% completely agreed), while at the other extremity of the spectrum, the exploitation of learners' activity in course forums by recommender systems was rejected by the majority of respondents (50.6% disagreed overall, among which 37.6% completely disagreed) (Figure 2). Recommendation algorithms' mobilization of learning habits also appeared to generate stronger rejection than data such as registration data.

Figure 2

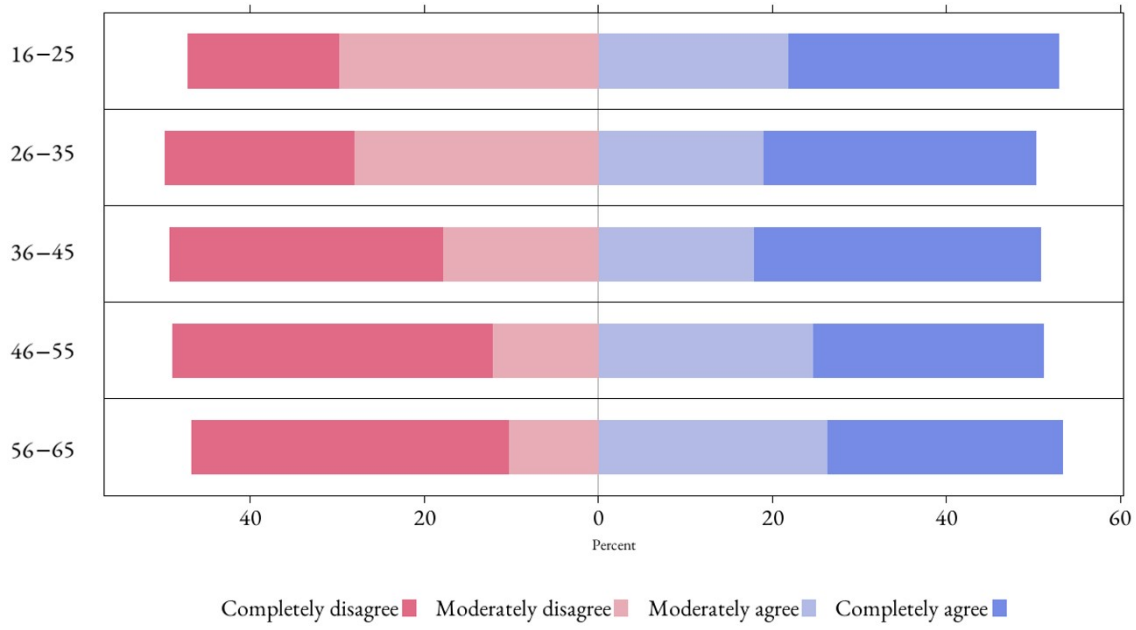
Posture Towards the Use of Different Types of Learner Data to Enable the Use of Recommendation Systems (N = 2,614)



Respondents' age was strongly correlated with their perspective on the use of different data in the recommender systems, as illustrated by algorithms' use of data about learning habits (X^2 [12, N = 2,614] = 129.7, $p < 2.10^{-16}$). Younger learners overall appeared less reluctant to have their data used. For instance, 17.2% of learners in the 16–25 age category completely opposed the use of data on learning habits for any type of recommendation, while this proportion reached 36.4% of older users in the 56–65 age category (Figure 3). This pattern appeared to be consistent across all types of data used by recommendation systems, and it also held when it came to the transmission of learners' data to third parties, as we will see in the next section.

Figure 3

Participants' Age and Posture on the Use of Learning Habits Data in Recommendation Algorithms (N = 2,614)

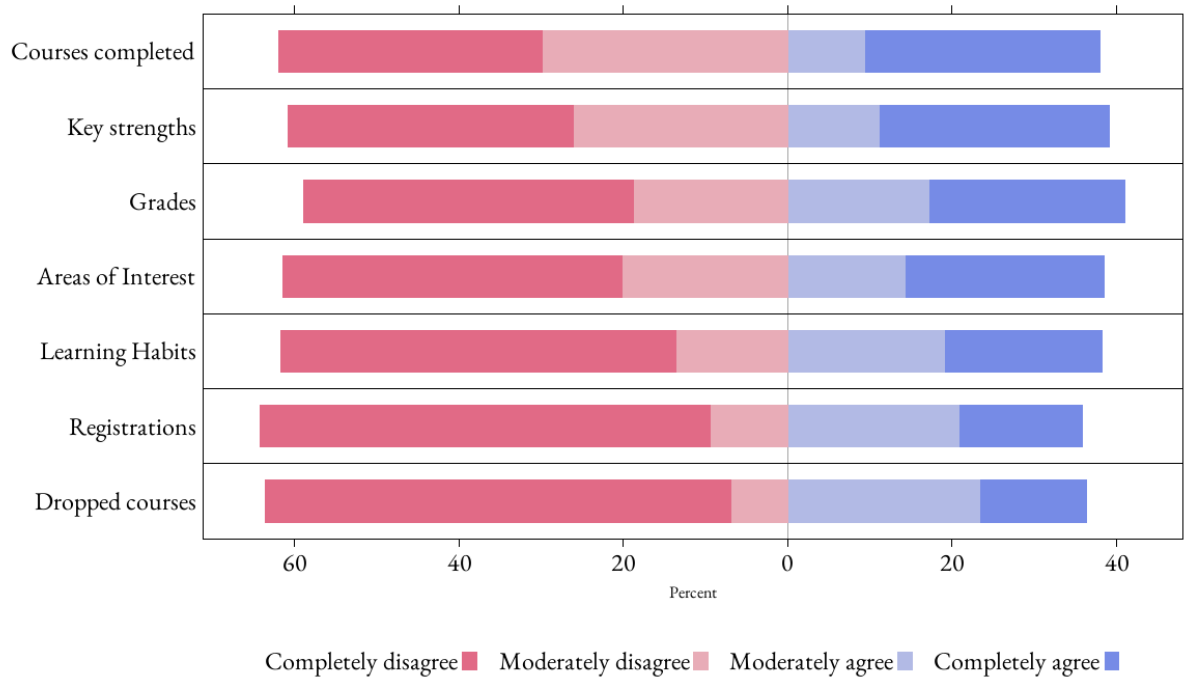


Transmission of Data to Third Parties and Generational Divides

Respondents overall opposed the possible transmission of their data to third parties, with a statistically significant difference across items (X^2 [9, N = 2,614] = 217.5, $p < 2.210^{-16}$) (Figure 4). This opposition was weaker for the list of courses that they had completed (only 33% completely disagreed) but appeared strong when it came to learning habits (49% completely disagreed) or to the different classes that they had registered to (55% completely disagreed).

Figure 4

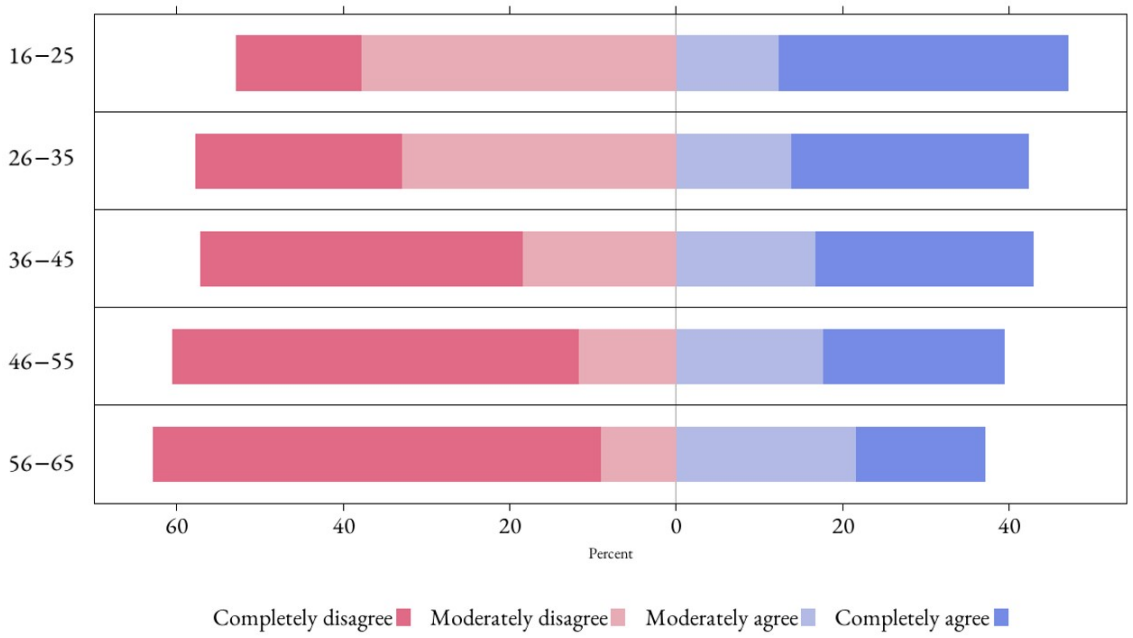
Learners' Stance on Data Transmission to Potential Recruiters (N = 2,614)



Learners' posture on data transmission to third parties depended upon their age. We found statistically significant relationships between age and all types of data, with stronger effects for data such as grades (X^2 [12, N = 2,614] = 279.2, $p < 2.10^{-16}$; Figure 5) and learning habits (X^2 [12, N = 2,614] = 252.8, $p < 2.10^{-16}$; Figure 6).

Figure 5

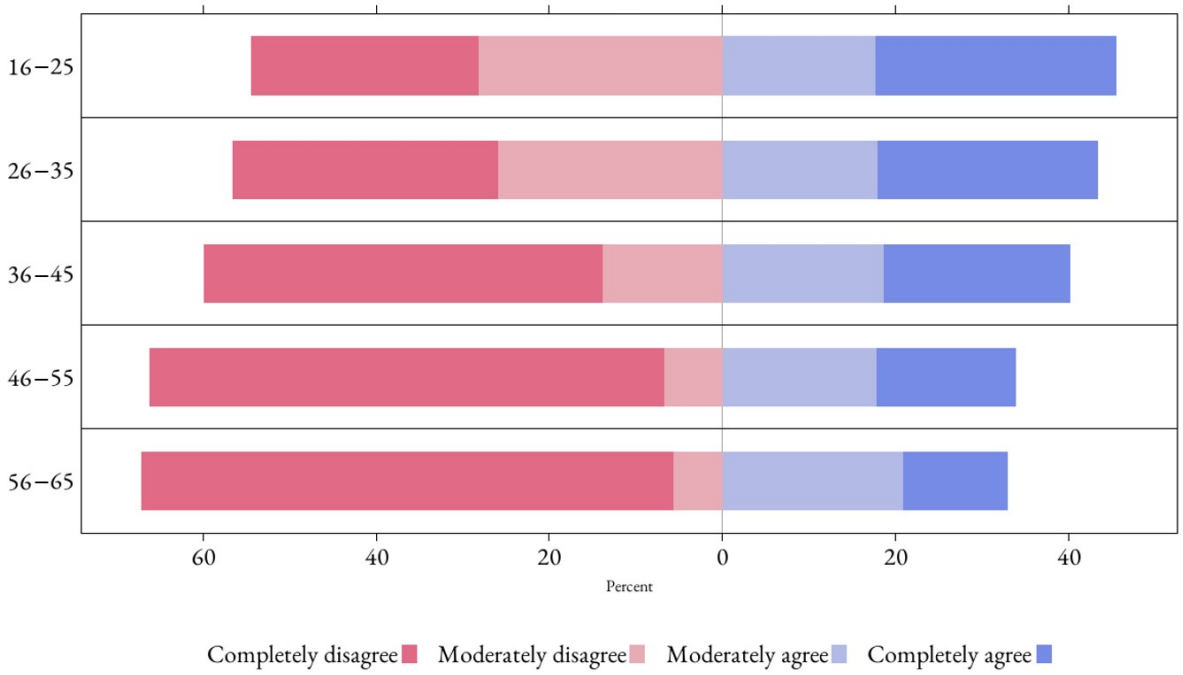
Relationship Between Age and Posture on Grade Transmission Data to Potential Recruiters (N = 2,614)



Younger generations (16–25 years) were much more open to the transmission of their grades (35% completely agreed; only 15% completely disagreed). Most respondents over 35 years old opposed the transmission of their grades; the ratio of respondents who completely disagreed to completely agreed reached 54% to 15% for those aged 56–65 (Figure 5). A similar trend was observed with regard to the transmission of data on learning habits. Among the youngest learners (Figure 6), 28% completely agreed while 26 % completely disagreed. For individuals aged 56–65, the former and the latter categories accounted for 12% and 61% of responses, respectively.

Figure 6

Relationship Between Age and Posture on Transmission of Learning Habits Data to Third Parties (Potential Recruiters, etc.; N = 2,614)



Discussion

We here discuss the questions of recommender systems and of transmission of data to third parties, which represent two typical uses of learners' data, on the one hand to improve the user experience and on the other hand to generate revenues. We then highlight the existence of a potential generational divide on data privacy, especially with regard to the transmission of data.

Recommender Systems

Like Arnold and Sclater (2017), we observed significant contrasts with regard to how respondents would react to a set of proposed use cases. The authors noticed that students were on average reluctant to the idea of their data being used to enable performance comparisons within the classroom, while, unsurprisingly, a minority would raise objections to these data being used to improve grades. Our study mirrored these findings. Participants generally exhibited favourable attitudes towards the different functionalities proposed, with one exception—exercise recommendation. A notable portion of the respondents expressed moderate disagreement with this case of data use, highlighting privacy concerns similar to those noted by Culnan and Armstrong (1999).

Drawing parallels with the concept of privacy calculus by Dinev and Hart (2006), we argue that students perform a cost–benefit analysis when determining the acceptability of data use. They weigh the potential benefits—such as improved grades—against the perceived privacy risks—such as the discomfort associated with performance comparisons if learning data were to be used outside of the context of recommender systems.

To address these variances in attitudes, MOOC platforms could consider offering a customizable user experience with regard to recommender systems. This approach aligns with Dinev's integrated model, in which perceived control over personal information is a key factor in privacy perceptions. As such, these platforms could allow learners to toggle specific features of the system. Some developers, such as Bousbahi and Chorfi (2015), have already taken steps in this direction by giving users the ability to select which data are fed into the recommendation algorithms. This approach affords a degree of personalization and imbues learners with a sense of control over their data, which, according to Culnan and Bies (2003), can effectively mitigate privacy concerns.

Consider a platform like Facebook as an example. Users on this social networking site are provided with the flexibility to determine their own privacy parameters. They can set rules on a variety of aspects such as who is permitted to view their profiles and personal details, the individuals who can locate them through the platform's search function, the methods through which others can contact them, and even the kind of personal narratives that get published on their profiles. Adjustable privacy settings seem to significantly influence users' comfort level regarding privacy. It has been posited that when individuals perceive that they have an adequate degree of control over their personal information, their concerns surrounding privacy typically diminish (Culnan & Armstrong, 1999).

Broadening user control over what is fed to the algorithms, as suggested by Bousbahi and Chorfi (2015), can significantly reduce resistance to adopting recommender systems in online learning platforms such as Coursera or FUN MOOC. When learners are given more autonomy over their data, they are likely to trust the system more, leading to higher engagement and more effective use of the recommender features. While it may be improbable for users to have a say in the decisions made by online learning stakeholders with regard to the use of these algorithms, providing them with a degree of control could prevent feelings of distrust. If users feel that their privacy is being violated, they may not necessarily stop using the platform, but they might choose to disregard the recommendations made by the system, rendering it less effective. Therefore, the sense of control over their data could not only ease privacy concerns but also boost the utility and relevance of the recommender systems.

Transmission of Data to Third Parties

Sharing data with third parties, such as potential recruiters, was once regarded as a promising business model for MOOCs and is now a practice that has been adopted by course platforms like Udacity (Allal-Chérif et al., 2021). Unsurprisingly, younger learners showed less reluctance than senior workers with regard to the transmission of their LA. This result is consistent with the generational divide that Miltgen and Peyrat-Guillard (2014) observed regarding data privacy in their qualitative study. Respondents entering the job market, in contrast to those with a well-established professional trajectory, might view data sharing as an opportunity to increase their visibility. However, third parties such as recruiters might be interested in data of which the transmission may not necessarily benefit learners.

Learning habits and details on uncompleted courses, whether due to lack of engagement or difficulties, could potentially offer employers deeper insights into an individual's profile. However, the transmission of this type of data would mean much weaker control for learners over the display of their activity on the course platform; it would represent a significant shift from the current situation, where individuals mostly show what classes they have engaged in (Allal-Chérif et al., 2021) or what certificates they have obtained (Radford et al., 2014), but not their grades, transmission of which could be informative for employers but harmful for potential applicants. Respondents' may be conscious of this misalignment,

which could explain why they appeared much more reluctant to share data on their learning habits than on their key strengths, for instance.

Arguably, in contrast with online platforms that focus exclusively on upskilling the workforce, generalist platforms like Coursera and FUN MOOC cover a diversity of topics that are arguably unrelated to learners' professional activity (poetry, etc.; Cisel, 2019). This means that these platforms potentially have detailed information on users' hobbies, as long as we consider that registering to a course signals someone's area of interest. Our results suggest that learners may be reluctant to the transmission of this type of data.

This is likely one of the unique aspects of generalist MOOC platforms: a learner might have different objectives depending on the type of course they enrol in (Kizilcec & Schneider, 2015). This is in contrast with career-oriented platforms—DataCamp, for example, which is focused on data science (Baumer et al., 2020). As Miltgen and Peyrat-Guillard (2014, p. 113) showed through focus groups, for similar types of data, individuals have a distinct stance on privacy depending on the context in which they could be used. Expectations regarding the management of their LA could vary significantly across different types of courses (e.g., career-oriented or hobby-oriented), adding complexity to the task of platforms striving to customize data management according to user preferences.

A Generational Divide in Terms of Data Privacy?

Concerning the correlation between learners' age and acceptance of the use of their data, our findings align with prior studies on users' viewpoints regarding data privacy (Miltgen & Peyrat-Guillard, 2014; Regan et al., 2013). While this generalized explanation may suffice for recommender systems, it seems less comprehensive when considering the question of data transmission to third parties, as it leaves essential queries unaddressed: How much do respondents' views hinge on their generational affiliation? How much do they rely on their age? Currently, it is challenging to determine whether the existing response structure will remain consistent over time.

The perceived value of visibility to potential recruiters—as understood in the Dinev et al.'s (2013) calculus framework—could largely hinge on the professional career stage that learners are in. For example, younger respondents who presently view data transmission favourably due to their quest for career opportunities may exhibit more reluctance once they have established themselves professionally. However, we might be witnessing a more lenient attitude towards data privacy from individuals born in the 1990s and 2000s, as they have been granting access to their data to various entities via their mobile devices or social networking accounts since their adolescence.

This debate echoes conversations around the cultural-historical activity theory (Roth & Lee, 2007), which asserts that an individual's cultural backdrop and the era in which they were born should be factored into the examination of their psychological traits and opinions. Distinguishing between these two competing explanations is crucial for predicting the evolution of citizens' perceptions of data privacy and its potential impact on future political decisions.

Conclusion

Limitations

This case study is not exempt from conventional scrutiny concerning the practical applicability of our results to the technological design and enhancement of the systems under consideration. Additionally, due to the specificity of our queries, our insights cannot be effortlessly generalized beyond the MOOC context. However, given that these courses now constitute a significant portion of the online education environment, we assert that despite the challenges related to the external validity of our findings, dedicated studies on ethical usage of online learners' analytics bear inherent value. A principal constraint of this research lies in our inability to comprehensively understand how learners perceive information privacy and retention at large, leaving us unable to determine if their views are unique to the educational context or not.

Perspectives

As MOOCs often host classes related to learners' hobbies, users may view data use on these platforms differently when compared with platforms that focus primarily on professional skills. Notably, platforms like DataCamp (Baumer et al., 2020) offer both courses and job opportunities, suggesting that learners' perceptions of recommender systems and data sharing with third parties like recruiters might differ when they view these platforms as both skill-development tools and career-advancement avenues.

Finally, contrasting respondents' viewpoints about their data use across different platforms (e.g., Facebook, Netflix, etc.), with the aim to determine if they adopt a more permissive attitude concerning their data usage in the context of MOOCs, would be enlightening. How would individuals who showed minimal hesitation about the use of their learning data react if other aspects of their lives were exposed? Would the generational divide be as pronounced on social media platforms?

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Discrepancies and Similarities Between Online and Face-to-Face Teachers' Use of Open Educational Resources (OER) for Teaching Purposes

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Abstract

The integration of open educational resources (OER) in the educational curricula of universities and educational organizations has gained tremendous popularity. However, there is a gap in research on teachers' attitudes toward OER in many developing countries. Using a mixed-methods approach, this study explored the use of OER by online and face-to-face teachers of English as a foreign language (EFL) in Iran. A total of 62 teachers (31 online teachers and 31 face-to-face teachers) participated in the study. Survey and interview results indicated that there were significant differences between online and face-to-face teachers' attitudes toward OER. Online teachers had a more positive attitude toward OER than face-to-face teachers. The perceived benefits of OER included developing the flexibility of curricula, encouraging personalized learning, and offering pedagogical options for teachers. There were several perceived OER-based challenges in the educational context of Iran as well. The challenges included teachers' uncertainty about copyright issues, the low quality of OER, teachers' low levels of digital literacy, teachers' unawareness of the existence of OER, the lack of quality control over OER, the lack of credibility of OER content, and the lack of up-to-dateness of OER. There were also significant differences between participants' perspectives on the types and frequency of using OER. More specifically, online teachers used OER for teaching practices more frequently than face-to-face teachers. Participants perceived that they needed various types of training for the appropriate use of OER. This study proposes several implications for renewing and improving teacher training/education programs and material development projects.

Keywords: open educational resources (OER), online teachers, face-to-face teachers, English as a foreign language, attitudes

Discrepancies and Similarities Between Online and Face-to-Face Teachers' Use of Open Educational Resources (OER) for Teaching Purposes

The application of open educational resources (OER) has become an integral element of many educational courses and programs. Every day, more teachers and students take an interest in the use of OER due to the benefits they offer for enhancing the quality of pedagogical and learning practices in educational settings (Dixon & Hondo, 2014; Fadehan & Okiki, 2023; Kelly, 2014; Luo et al., 2020; Pérez-Paredes et al., 2018; Rolfe, 2012; Whyte et al., 2014; Wiley et al., 2014). OER can have considerable merits for education, including convenient access to high-quality and pertinent learning resources, enhancement of students' and teachers' educational activities, efficient cost and time management, and appropriate adaptation of instructional materials and resources (Butcher, 2015). Using OER can also provide a yardstick for teachers to compare their own teaching resources with those that are available for free. Moreover, the use of OER enables teachers to bring about innovation and creativity in their practice and production/adaptation of teaching resources and materials. One important benefit of OER use can be adapting teaching to students' learning styles, preferences, and strategies (Krelja Kurelovic, 2016; McGreal et al., 2013).

Regarding the use of OER in the educational context of Iran, Moradi and Abdi (2021) argue one important measure to help teachers and students use OER is to enhance their knowledge about OER and encourage them to produce and use OER professionally and appropriately. They argue that attitudes need to change, and teachers and students should be trained and guided on how to make use of OER more efficiently. They also point out that there are some institutional, cultural, professional, and financial barriers to the use of OER in the educational context of Iran. Moreover, the use of OER has also been believed to cause some limitations and challenges for students and teachers. Some challenges, such as concerns about copyright ownership, the cost of adapting, revising, or accessing OER, teachers' and students' low digital literacy levels to use OER properly, and concerns about the quality of OER for teaching and learning purposes, have been echoed in previous literature (Krelja Kurelovic, 2016). Taking into account that online teachers need to use online resources and materials frequently, it is essential that face-to-face and online teachers' use of OER be investigated. Research has predominately focused on either online teachers' or face-to-face teachers' use of OER, while there may be differences between the attitude, level of use, or training needs of these two groups of educational stakeholders. Therefore, the current study set out to consider this research gap and explore online and face-to-face teachers' practices and attitudes regarding the use of OER for their educational practices.

Literature Review

In Pakistan, Hussain et al. (2013) explored university instructors' attitudes toward the use of OER. The instructors had positive views about using OER in that educational context. The perceived benefits of using OER comprised increased access to teaching materials, easier access to previous research in order to carry out further research, and free access to teaching materials. Some perceived challenges, including problems with Internet connections and speed, the possibility of computer viruses and problems, and eye strain, were reported. In a cross-national study, Garrote Jurado and Pettersson (2015) investigated the attitudes of

university lecturers from four geographical locations (Cuba, Guatemala, Peru, and Brazil) toward the use of OER. The results of the survey indicated that the lecturers who were more positive about using OER encouraged their students to use OER more frequently. The lecturers perceived the workload caused by searching for and using OER as a challenge. The study concluded that supporting and encouraging teachers plays an important role in lecturers' acceptance of OER.

In Greece, Georgiadou and Kolaxizis (2019) assessed film students' perspectives on OER. They reported that students had positive attitudes toward using OER, while they were not fully aware of the existence of these resources. It was suggested that university instructors should make students familiar with OER and their possible benefits for students' learning processes.

Likewise, Reed (2012) examined educational stakeholders' attitudes toward the open-content movement in the UK. The staff seemed to be aware of the open-content movement. Participants were willing to share and reuse content. Copyright and licensing were issues that could be challenging.

In India, Mishra and Singh (2017) carried out a study on faculty members' perceptions regarding barriers to the use of and the quality of OER. The findings revealed positive perspectives, but the participants had limited use of OER. The study also showed faculty members' low knowledge of and familiarity with Creative Commons and OER.

Zagdragchaa and Trotter (2017) focused on the practices and activities educators used regarding OER in Mongolia. The results demonstrated that despite some measures being taken to facilitate OER inclusion, instructors and educators had limited awareness of OER and its use in their educational practices. It was also argued that the culture of OER adoption had not been established yet and that the relevance of OER was the most important quality educators took into account.

In South Africa, Wolfenden et al. (2017) sought educators' attitudes toward using OER. The analysis of the context showed that OER use was limited due to several challenges. "Demands of curriculum and assessment, professional identity, digital skills, provision of equipment and connectivity, values and weak cultures of collaboration" (p. 252) were reported as the main challenges of the use of OER. The study suggested that the issue of access was an important factor and that easy access to OER could facilitate its use in educational courses.

Oates et al. (2017) used a mixed-methods study to delve into educators' use of OER in Afghanistan. It was found that teachers were positive about using OER for preparing lessons and assessment activities. There were also some teachers who did not use OER and preferred to use traditional teaching materials for their educational practices. Additionally, teachers were not fully aware of the meaning of openness in the concept of OER and believed all materials accessed from the Internet could be OER.

While previous literature on teachers' attitudes toward OER has focused on face-to-face teachers in general, there is a dearth of research on the comparison of online and face-to-face teachers' attitudes toward using OER in literature on educational technology. Using mixed methods, this study examined the attitudes of both online and face-to-face teachers of English as a foreign language (EFL) toward using OER. One major aim of the study was to compare the views of these two groups of teachers toward OER.

Methodology

Research Questions

The following research questions were considered for this study:

1. What are the attitudes of Iranian online and face-to-face teachers toward using OER for their teaching practice? Are there significant differences in these attitudes between Iranian online and face-to-face teachers?

2. What are the perspectives of Iranian online and face-to-face teachers on the challenges of using OER for their teaching practice? Are there significant differences in these perspectives between Iranian online and face-to-face teachers?

3. What types of OER are used, and how frequently are they used by Iranian online and face-to-face teachers? Are there significant differences in the types of OER used and the frequency of OER use between Iranian online and face-to-face teachers?

4. What are the perspectives of Iranian online and face-to-face teachers on the OER-based training they should receive? Are there significant differences in these perspectives between Iranian online and face-to-face teachers?

Participants

Two groups of EFL teachers (face-to-face and online) participated in the study. The teachers worked at eight well-known language-teaching institutions in Alborz and Tehran, two major provinces of Iran. The two regions are close to each other, and the participants were chosen from two neighboring regions in Iran. The sample comprised 31 online teachers (17 male and 14 female teachers) and 31 face-to-face teachers (19 males and 12 females). The online teachers had an average six years' experience of online EFL teaching, and the face-to-face teachers had an average of eight years' experience of teaching face-to-face EFL courses. The age range of the online teachers was 22–41 years and the age range of the face-to-face teachers was 21–45.

To select the participants, the researchers included those participants who were users of OER and knew the concept of OER. Before participating in the study, some questions were asked regarding participants' familiarity with and use of OER. Those participants who did not know the concept of OER or were not users of OER were excluded from the study. All of the participants of the study had been using OER for at least two years. The participants were invited to take part in the interviews, with a total of 23 online teachers and 21 face-to-face teachers accepting the invitation and taking part. Participation in the study was on a voluntary basis.

Instruments and Data Collection

As attitudes are complex, mixed-methods studies are recommended for gaining a deeper understanding of the phenomena (Johnson et al., 2007). Accordingly, this study incorporated a mixed-methods design comprising both surveys and interviews.

First, a survey was used in this study. The items of the survey were developed after reviewing and analyzing previous literature and theoretical issues and principles pertinent to OER use in educational contexts (e.g., Krelja Kurelovic, 2016; Oates et al., 2017; Wolfenden et al., 2017; Zagdragchaa & Trotter, 2017). Moreover, three experts in educational technology were invited to provide feedback on the relevance and significance of the survey items. A checklist was designed, and several versions of the survey were submitted to the experts in order to prepare the final version. In addition, some pre-study interviews were conducted to gain an understanding of the context of OER use and improve the survey items. The participants at this stage were 10 online and face-to-face teachers from the same regions the study was conducted in. The survey was then administered to 10 face-to-face and online teachers, and their comments on the clarity of the items were sought to establish the face validity of the survey.

The survey comprised 56 items. The first part of the survey focused on the attitudes of Iranian online and face-to-face teachers toward using OER for their teaching practice. A total of 19 items were included in this section. The section comprised five-point Likert scale items ranging from "strongly disagree" to "strongly agree." The Cronbach's alpha of this survey section was 0.846.

The next section explored the perspectives of Iranian online and face-to-face teachers on the challenges of using OER for their teaching practice. This section comprised 13 five-point Likert scale items (ranging from "strongly disagree" to "strongly agree"), and its Cronbach's alpha was 0.797.

The third and fourth parts of the survey investigated the types of OER used and the frequency of OER use by Iranian online and face-to-face teachers. Section 3, which investigated the frequency of using different kinds of OER, contained 10 Likert scale items ranging from "never used" to "always using." The section's Cronbach's alpha was 0.860. The fourth section of the survey, which investigated the frequency of the use of different modalities of OER, consisted of six items Likert scale items, ranging from "never used" to "always using." The Cronbach's alpha of section 4 was 0.600.

The last section examined the perspectives of Iranian online and face-to-face teachers on the OER-based training they should receive. The section comprised 7 Likert scale items ranging from "strongly disagree" to "strongly agree," and its Cronbach's alpha was 0.749.

The Cronbach's alpha indices showed acceptable levels of reliability for different sections of the survey. The survey's overall Cronbach's alpha index (0.897) also revealed a high level of reliability.

Semi-structured interviews with teachers were also used in the study. Interview questions were developed based on previous literature and consultation with the three educational technology experts. To implement methodological triangulation, interview questions were designed based on the survey's aims and objectives. The questions were as follows:

1. How do you evaluate the use of OER for teaching English as a foreign language? What are some benefits of the use of OER for EFL teachers in your view? Why do you think so?

2. What do you think are the challenges of the use of OER for your teaching practice? Would you mind explaining each challenge?

3. What types of OER do you usually use for your teaching practice? Do you use them frequently? How often do you use them?

4. Have you received any training regarding your use of OER? What aspects of using OER do you need training for? Would you mind explaining more?

Data Analysis

The data from the surveys were analyzed using SPSS 16. The mean and standard deviation were used to show the results of each item of the survey. A non-parametric Mann-Whitney U test was used to identify the differences between the two participant cohorts' perspectives. Content analysis and thematic analysis were used to analyze the qualitative data of the interviews.

Findings

Attitudes Toward OER

Surveys

Table 1 indicates the attitudes of online and face-to-face teachers toward OER. The Mann-Whitney U test showed significant differences between these attitudes. While online teachers agreed or strongly agreed with the merits of OER, face-to-face teachers were less positive about the use of OER for their educational practices. The groups agreed on some benefits of OER, such as the flexibility of curricula due to OER use, encouragement of personalized learning, and provision of pedagogical options for teachers.

Table 1

Online and Face-to-Face Teachers' Attitudes Toward OER

Survey items	Participants	M	SD	Mann-Whitney U	Sig.
1. Using OER enhances students'/teachers' access to learning materials	Online teachers	4.22	0.56	300.500	**.005***
	Face-to-face-teachers	3.64	0.87		
2. The content of OER can be improved and edited	Online teachers	3.87	0.61	308.000	**.009***
	Face-to-face-teachers	3.22	1.11		

3. Using OER is cost-effective for learners	Online teachers	4.35	0.48	307.500	**.005***
	Face-to-face-teachers	3.90	0.65		
4. Using OER is time-efficient	Online teachers	4.16	0.77	330.000	**.018***
	Face-to-face-teachers	3.74	0.77		
5. Using OER fosters students' and teachers' digital literacy levels	Online teachers	4.19	0.74	330.500	**.020***
	Face-to-face-teachers	3.67	0.90		
6. Students can participate in co-creating OER	Online teachers	4.32	0.54	263.500	**.001***
	Face-to-face-teachers	3.61	0.88		
7. Using OER promotes student-centered learning	Online teachers	4.06	1.31	344.000	**.041***
	Face-to-face-teachers	3.70	1.03		
8. OER facilitates equal access to learning materials	Online teachers	4.25	0.57	320.500	**.016***
	Face-to-face-teachers	3.58	1.17		
9. Using OER enhances the flexibility of the curriculum	Online teachers	4.09	0.78	320.500	.057
	Face-to-face-teachers	3.67	0.90		
10. Using OER promotes learners' retention	Online teachers	4.19	0.65	293.000	**.004***
		3.51	0.96		

	Face-to-face-teachers				
11. Using OER provides teachers with more pedagogical options	Online teachers	4.25	0.44	369.500	.083
	Face-to-face-teachers	3.67	1.27		
12. OER expedites the dissemination of learning information/content	Online teachers	4.51	0.50	296.500	**.004***
	Face-to-face-teachers	3.96	0.79		
13. Using OER increases diversity in the curriculum	Online teachers	4.09	0.78	276.000	**.002***
	Face-to-face-teachers	3.29	1.18		
14. Using OER facilitates the process of ubiquitous learning	Online teachers	4.16	0.68	239.000	**.000***
	Face-to-face-teachers	3.29	0.97		
15. Using OER encourages personalized learning	Online teachers	4.22	0.61	366.000	.072
	Face-to-face-teachers	3.77	0.99		
16. Using OER fosters equity in education	Online teachers	4.54	0.67	230.500	**.000***
	Face-to-face-teachers	3.22	1.49		
17. Using OER facilitates teaching based on different learning styles	Online teachers	4.38	0.55	266.500	**.001***
	Face-to-face-teachers	3.15	1.20		
18. Using OER encourages	Online teachers	4.35	0.60	285.000	**.004***

pedagogical innovation for teachers	Face-to-face-teachers	3.51	1.20		
19. Using OER facilitates collaboration with online communities of practice	Online teachers	4.09	0.74	269.500	**.001***
	Face-to-face-teachers	3.35	0.91		

Note. Likert scale: 1 = Strongly disagree, 2 = Disagree, 3 = Neither agree nor disagree, 4 = Agree, 5 = Strongly agree; $^{*}p \leq .05$

Interviews

The interview findings confirm the survey results in general. Online teachers were more aware and positive about the existence and use of OER for their teaching practices. They believed that the use of OER could promote their access to teaching materials and that this would save them preparation time. Online teachers were also of the opinion that using OER could reduce the costs of accessing materials, and that using OER could increase collaboration between teachers inside and outside the country. In contrast, the majority of face-to-face teachers did not have high awareness of the benefits of OER. Few of them asserted that OER was a suitable tool for improving their teaching practice.

Challenges of Using OER

Surveys

As Table 2 depicts, there were both discrepancies and similarities between the perspectives of online and face-to-face teachers on the challenges of using OER. The teacher groups agreed that the main challenges of using OER were uncertainty about copyright issues, the low quality of OER, low levels of teachers' digital literacy, teachers' unawareness of the existence of OER, the lack of quality control in OER, the lack of credibility of OER content, and OER's lack of up-to-dateness. The results of the Mann-Whitney U test did not show significant differences among the participants' perspectives for the other survey items.

Table 2

Online and Face-to-Face Teachers' Perspectives on the Challenges of Using OER

Survey items	Participants	M	SD	Mann-Whitney U	Sig.
1. Uncertainty about copyright/intellectual property concerns of OER	Online teachers	4.12	0.67	437.500	.499
	Face-to-face-teachers	4.12	0.99		

2. The low quality of OER	Online teachers	3.87	0.76	402.000	.241
	Face-to-face-teachers	3.54	1.05		
3. The inadequate digital literacy of teachers to use OER	Online teachers	4.09	0.70	455.000	.689
	Face-to-face-teachers	4.09	0.90		
4. The complicated process of developing OER	Online teachers	3.29	1.03	255.000	**.001***
	Face-to-face-teachers	4.09	1.16		
5. Unawareness of teachers about the existence of OER	Online teachers	4.38	0.71	418.500	.343
	Face-to-face-teachers	4.06	1.09		
6. The lack of quality control over OER	Online teachers	4.32	0.74	415.500	.323
	Face-to-face-teachers	4.03	1.04		
7. The lack of access to OER	Online teachers	3.87	0.80	124.500	**.000***
	Face-to-face-teachers	2.29	1.10		
8. The lack of access to quality Internet connection	Online teachers	3.83	0.82	113.500	**.000***
	Face-to-face-teachers	2.25	0.92		
9. Lack of credibility of the content of OER	Online teachers	3.93	0.92	398.000	.218
	Face-to-face-teachers	4.06	1.31		

10. The lack of access to digital devices (tablets, laptops, smartphones) to access OER	Online teachers	3.77	0.71	192.000	**.000***
	Face-to-face-teachers	2.41	1.25		
11. The high costs of maintenance relevant to OER	Online teachers	3.67	1.04	143.500	**.000***
	Face-to-face-teachers	2.06	1.03		
12. The lack of interaction between teachers and students due to OER use	Online teachers	3.77	0.71	297.000	**.006***
	Face-to-face-teachers	3.16	0.86		
13. The lack of currentness (up-to-dateness) of OER	Online teachers	4.25	0.44	454.000	.662
	Face-to-face-teachers	4.00	1.03		

Note. Likert scale: 1 = Strongly disagree, 2 = Disagree, 3 = Neither agree nor disagree, 4 = Agree, 5 = Strongly agree; $^{*}p \leq .05$

Interviews

The findings of the interviews showed that both groups had a high level of awareness of the challenges of using OER. One important challenge reported by both online and face-to-face teachers was the issue of copyright and its ownership. Participants reported that they did not know about all the regulations regarding OER copyright. They also believed that the majority of teachers, especially older ones, did not know about the importance of OER nor use it for their teaching. Some teachers also pointed out that OER usually comprises localized materials with a very specific focus and scope that cannot be used for other contexts, and that it was too time consuming to adapt or revise these materials for a context's specific teaching objectives.

OER Kinds Used and Frequency of Using Different Modalities of OER

Surveys

Table 3 illustrates online and face-to-face teachers' use of OER types and frequency of their usage. The findings of the Mann-Whitney U test demonstrate significant differences between the two participant groups' perspectives. While online teachers usually used OER, face-to-face teachers rarely or sometimes used OER.

Table 3

Online and Face-to-Face Teachers' Type and Frequency of Using OER

Survey items	Participants	M	SD	Mann-Whitney U	Sig.
1. Massive open online courses (MOOCs)	Online teachers	4.12	0.71	129.000	**.000***
	Face-to-face-teachers	2.54	1.12		
2. Open textbooks	Online teachers	4.32	0.74	205.000	**.000***
	Face-to-face-teachers	3.09	1.22		
3. Openly licensed multimedia	Online teachers	4.32	0.70	244.500	**.000***
	Face-to-face-teachers	3.22	1.30		
4. Open digital educational games	Online teachers	3.93	0.72	107.000	**.000***
	Face-to-face-teachers	2.35	0.98		
5. Open lesson plans	Online teachers	3.77	0.80	224.500	**.000***
	Face-to-face-teachers	2.28	1.48		
6. Open lectures	Online teachers	4.12	0.49	183.500	**.000***
	Face-to-face-teachers	2.70	1.29		
7. Open tests/ assessment tools	Online teachers	4.03	0.79	197.500	**.000***
		2.83	1.09		

	Face-to-face-teachers				
8. Open podcasts	Online teachers	4.13	0.61	216.500	**.000***
	Face-to-face-teachers	2.96	1.13		
9. Open syllabi	Online teachers	3.80	0.70	325.500	**.021***
	Face-to-face-teachers	3.03	1.35		
10. Open course lessons/units	Online teachers	4.03	0.75	203.000	**.000***
	Face-to-face-teachers	2.64	1.35		

Note. Likert scale: 1 = Never using, 2 = Rarely using, 3 = Sometimes using, 4 = Usually using, 5 = Always using; *$p \leq .05$

Online and face-to-face teachers also reported that they usually used text-, video-, and multimedia-based OER. However, there were significant differences between the groups' frequency of using audio-, animation-, and image-based OER (Table 4).

Table 4

Online and Face-to-Face Teachers' Type and Frequency of Using OER

Survey items	**Participants**	**M**	**SD**	**Mann-Whitney U**	**Sig.**
1. Text-based OER	Online teachers	4.16	0.86	469.000	.862
	Face-to-face-teachers	4.12	1.05		
2. Video-based OER	Online teachers	3.96	0.87	439.000	.540
	Face-to-face-teachers	3.74	1.15		

3. Audio-based OER	Online teachers	4.00	0.77	241.000	**.000***
	Face-to-face-teachers	2.90	1.24		
4. Animation-based OER	Online teachers	3.38	0.80	233.500	**.000***
	Face-to-face-teachers	2.51	1.15		
5. Image-based OER	Online teachers	4.32	0.74	152.000	**.000***
	Face-to-face-teachers	2.58	0.84		
6. Multimedia-based OER	Online teachers	4.09	0.70	403.500	.236
	Face-to-face-teachers	4.16	1.09		

Note. Likert scale: 1 = Never using, 2 = Rarely using, 3 = Sometimes using, 4 = Usually using, 5 = Always using; *$p \leq .05$

Interviews

The results of the interviews illustrated that both online and face-to-face teachers made use of OER for their teaching practices. Online teachers reported that they commonly used OER for their classes and they sometimes adapted it. However, face-to-face teachers did not use it very frequently and the majority of them reported that they did not adapt or revise OER materials and used them as they were. The participants used OER in the form of texts and videos. Some participants reported that they used images as well.

OER-Based Training Needs for Teachers

Surveys

Table 5 shows the training needs of online and face-to-face teachers. Mann-Whitney U tests show that there are no significant differences between the perspectives of online and face-to-face teachers regarding their training needs. The participants unanimously emphasized the importance of training regarding quality assessment, copyright issues, the establishment of OER repositories, integration of OER into teaching objectives, open pedagogy, enhancement of the quality of OER, and familiarization with OER relevant to language-teaching purposes.

Table 5

Online and Face-to-Face Teachers' OER-Based Training Needs

Survey items	Participants	M	SD	Mann-Whitney U	Sig.
1. Training teachers to assess the quality of OER	Online teachers	4.32	0.70	439.000	.527
	Face-to-face-teachers	4.25	0.75		
2. Training teachers about the copyright issues regarding using OER	Online teachers	4.48	0.62	437.000	.491
	Face-to-face-teachers	4.38	0.61		
3. Training teachers to establish repositories of OER	Online teachers	4.12	0.61	455.500	.700
	Face-to-face-teachers	4.00	0.89		
4. Training teachers to integrate OER into their teaching practices /objectives	Online teachers	4.03	0.91	467.500	.846
	Face-to-face-teachers	4.09	0.83		
5. Training teachers to implement open pedagogy/education	Online teachers	4.29	0.73	465.500	.818
	Face-to-face-teachers	4.31	0.79		
6. Training teachers to enhance the quality of OER	Online teachers	4.32	0.74	377.500	.107
	Face-to-face-teachers	3.96	0.94		
7. Training teachers to become familiar with OER suitable for language teaching	Online teachers	4.35	0.70	391.500	.171

	Face-to-face-teachers	4.12	0.67

Note. Likert scale: 1 = Strongly disagree, 2 = Disagree, 3 = Neither agree nor disagree, 4 = Agree, 5 = Strongly agree; $^{*}p \leq .05$

Interviews

In the interviews, both online teachers and face-to-face teachers reported that they had not received any training for using OER. The majority of participants were aware that training could have positive effects on their use of OER. The participants' consensus was that copyright regulations related to OER use should be taught. The other important training need reported by most of the participants was ensuring the quality of the OER they used for their teaching practice. They stated that they needed to learn strategies to deal with the quality control of OER.

Discussion and Conclusion

This study examined the attitudes of online and face-to-face teachers toward using OER. The findings illustrated that online teachers were positive about OER, but face-to-face teachers were less positive. It might be concluded that online teachers spend more time in online environments and they often find their own teaching materials on the Internet, and this exposure and need might be a reason for the difference between the two groups' attitudes. The groups agreed that the benefits of OER include curricula flexibility, the encouragement of personalized learning, and the provision of pedagogical options for teachers. Face-to-face teachers' lack of Internet use might be a major impediment to their positive attitudes toward OER. The other issue is that many face-to-face teachers use mainstream textbooks in class and do not use Internet-based supplementary materials or teaching aids. These findings on teacher attitudes align with findings of previous studies (e.g., Garrote Jurado and Pettersson, 2015; Mishra and Singh, 2017; Oates et al., 2017). It is essential that face-to-face teachers become more aware of the benefits of OER and be exposed to it on a regular basis. There is a range of factors, such as burnout, job dissatisfaction, and lack of Internet access, that can undermine the importance of OER use for language teachers.

More importantly, the participants of the two groups expressed their concerns about several challenges that impeded the use of OER in the Iranian educational context. Teachers' unfamiliarity with copyright and intellectual property regulations was perceived as an important obstacle to the use of OER. The low quality of OER, teachers' low levels of digital literacy, teachers' unawareness of the existence of OER, the lack of quality control over OER, the lack of OER content's credibility, and OER's lack of up-to-dateness were other perceived obstacles. Similar obstacles were reported in previous studies on teachers' attitudes toward the use of OER (Hussain et al., 2013).

These challenges may explain face-to-face teachers' less positive attitudes toward OER. As Garrote Jurado and Pettersson (2015) argue, teachers who hold positive attitudes toward OER can motivate their learners to use OER for learning purposes as well. When the use of OER is restricted by some challenges, some teachers may avoid using OER. The majority of the challenges the participants reported can be removed

through training or by providing hardware or software infrastructures for the use of OER. It is recommended that educational course designers and directors take practical measures to pave the way for teachers to adopt technology-enhanced approaches in their teaching practices.

The results of the study also showed that while online teachers usually use OER-based materials, face-to-face teachers do not use them frequently. There were statistically significant differences among the perspectives of the online and face-to-face teachers in this regard. The proper and consistent use of OER requires some conditions. Teachers' digital literacy can be an important factor that can encourage or discourage them to use OER for their teaching practices. The results also indicated that the majority of online and face-to-face teachers used text-, video-, and multimedia-based OER. More awareness-raising and encouraging activities should be taken into account to motivate teachers to use a wider range of OER in educational settings.

Furthermore, the participants of both groups agreed that training on a range of OER-based aspects should be provided. Teachers reported that they needed training regarding quality assessment, copyright issues, the establishment of OER repositories, integration of OER into teaching objectives, open pedagogy, enhancement of the quality of OER, and familiarization with OER relevant to language-teaching purposes. One serious challenge of using OER is the issue of training. Many educational directors may believe that teachers can learn how to use OER through inductive practice. When training is provided for teachers, however, they can be more confident in the use of technology, including OER. Further research should be implemented to identify what kind of training can lead to the effective use of OER in the EFL context of Iran. Experimental and longitudinal studies can complement the results of this study regarding the OER-based training needs of EFL teachers.

The present study offers several implications for EFL stakeholders. First, teacher trainers and educators of EFL can use the findings of this study and include some specific training for EFL teachers on how to include and use OER in their teaching practice. The study can also raise EFL teachers' awareness about the potential of OER to improve the quality and mechanisms of teaching and learning. Teachers could also identify what OER can be effective for EFL teaching, and course designers and curriculum developers could consider the inclusion of OER in Iran's EFL curriculum. Furthermore, material developers can encourage EFL teachers to use OER-based materials and include OER in their textbooks or supplementary materials developed for teachers and students. Periodic on-the-job training or workshops on the use of OER should also be considered for EFL teachers.

This study had some limitations. The first was that only teachers who knew about OER and used it were included in the study, reducing the sample size. The second limitation was that only teachers from one context (language-teaching institutions) were included in the study. Therefore, caution should be exercised in generalizing the results of the study in another educational context, such as universities or schools.

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Understanding Indigenous Learners' Experiences During the First and Second Wave of the COVID-19 Pandemic

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Abstract

This paper focuses on the experiences of Indigenous learners at Athabasca University. Having access to online education provided a sense of normalcy for students during the global pandemic while many post-secondary institutions and Indigenous communities were closed. The purpose of the research was two-fold: a) to determine the dynamics of reaching Indigenous learners and measuring their adaptability in learning during the COVID-19 pandemic, and b) to understand the effects of the pandemic on the mind, body, spirit, and social environment of Indigenous distance education learners and their families. This research included qualitative and quantitative methods, specifically, a survey, focus group, and individual interviews. We share the results of online research involving Indigenous students during the first and second waves of the COVID-19 pandemic. We concluded that listening to Indigenous students supported their online education while giving them an outlet to express their experiences. This research identified Indigenous student adaptations towards their spirituality in specific ways inherent to their culture given the reactions to COVID-19, their responses, and reflections.

Keywords: COVID-19, Indigenous students, Canada, online education, society, culture, health, well-being

Glossary

When using Roman orthography, we do not capitalize Cree words. The word Cree is a word given by the French to describe nehiyawak people.

nimewêhtên pikiskwasên: This phrase spoken by a student means "thank-you for the conversation"

iyiniw: Indigenous person

nehiyawak: a term used to describe Cree people

nehiyawewin: the language used by Cree people

nehiyaw: an individual Cree person

iyiniwak: Indigenous people

oskiy'siniyiwak: New People (youth)

Understanding Indigenous Learners' Experiences During the First and Second Wave of the COVID-19 Pandemic

Leanne Simpson (2008) has written about the Oshkimaadiziig, the Anishnaabeg word for New People, who were living during the times of the seventh fire. For the eighth and eternal fire to be lit, the responsibility of the New People was to revive the "language, philosophies, political and economic traditions, our ways of knowing, and our culture [to return to] visions of peace and justice" (p. 14). Similarly, oskiy'siniyiwak is the nehiyawewin word referring to the youth who are new people. To respect the International Decade of Indigenous Languages (2022–2032), this paper offers Cree language and cultural concepts in the context of observing and listening to what Indigenous students in an online environment said about the COVID-19 pandemic, specifically the first and second waves.

We all faced challenging times during the ongoing global pandemic. We witnessed widespread advocacy in Canada to address the Wet'suwet'en conflict between hereditary chiefs, and the Coastal GasLink pipeline through northwestern B.C. that delayed construction (McIvor, 2020). Tense global issues between the U.S. and North Korea over missiles were unsettling (Bicker, 2019), and tragedy on an international flight shocked and saddened Canadians who watched the footage of people departing Tehran shot down leaving all 176 of them dead (British Broadcasting Corporation, 2020). The quarantine of passengers aboard ships captured media attention while countries around the world were affected by the first wave of the novel virus. There were stressors in place before people got sick. These challenging times were promulgated on January 30, 2020, when the World Health Organization (WHO) declared a global public health emergency, followed by the February 11 announcement that the coronavirus was identified as COVID-19. It was recognized as a pandemic on March 11, 2020 (Cucinotta & Vanelli, 2020). In Canada, First Nations communities began to lock down and create social distancing bubbles at the same time provinces were locking down for the first wave. While Mother Earth herself was less polluted (Tian et al., 2021), the Black Lives Matter movement demanded justice and Indigenous peoples rallied to support this movement.

By May 16, 2021, COVID-19 had officially claimed 3,364,178 lives around the world (World Health Organization, 2021), and there were 24,948 deaths in Canada (Government of Canada, 2021). Canada, the United States, and Mexico are Turtle Island. The southern part of Turtle Island, Mexico, was reported to have the worst observed case fatality ratio of 9.3% (John Hopkins University & Medicine, 2021). Further, a review of Mexican Ministry of Health data demonstrated that Indigenous peoples in Mexico had a higher risk of death from COVID-19, especially outside the hospital, showing they had less access to care during the pandemic (Ibarra-Nava et al., 2021).

Socio-economic factors and lack of adequate housing impacted viral transmission among Indigenous people in Canada (Isaac-Mann et al., 2021). The first confirmed case of COVID-19 in Treaty 8 (Alberta) affected Sucker Creek First Nation on April 20, 2020 (Heidenreich, 2020). This paper focuses on the experiences of iyiniwak learners at Athabasca University during the first and second wave of the pandemic.

Athabasca University's main campus is in the town of Athabasca, Alberta, Canada, located within Treaty 6 and bordering Treaty 8. It is the first Canadian university to specialize in distance education. On April 7, 2020, the University's Research Centre issued a special call for proposals to understand the effects of the COVID-19 pandemic. Our research study focused on the Indigenous learner's experience the challenges and

barriers they experienced, and how they adapted amidst rapid health and social change. By addressing the topic areas, we sought to understand how the COVID-19 pandemic affected Indigenous learners regionally and nationally. Therefore, in response to the Truth and Reconciliation Commission of Canada: Calls to Action, our role as researchers in this capacity is to seek culturally relevant ways to support Indigenous learners in their pursuit of post-secondary education considering the pandemic triggered historical memory of traumas on Turtle Island and cultural genocide in residential schools. The Calls to Action are a reminder to society and post-secondary institutions of the need for ongoing support of First Nations, Métis, and Inuit peoples. It is an important part of Athabasca University's mandate to break down educational barriers, and this study tried to identify what some of them are and exactly how to approach the problem.

There are approximately 32,000 Indigenous students at post-secondary institutions in Canada (Canadian Federation of Students Ontario, 2021). At Athabasca University, 3,849 iyiniwak students self-identify as First Nations, Métis, or Inuit; 140 iyiniwak students participated in this research study. Josie Auger, Janelle Baker, Martin Connors, and Barbara Martin used multiple methods including an online survey, focus group, and telephone interviews to learn from iyiniwak students.

I, Josie Auger, am a nehiyaw Associate Professor in Indigenous Studies from Treaty 8. I introduce the team. From my worldview, spirit is part of the natural, and I introduce those concepts by recognizing my own thoughts and feelings. Out of respect for the spiritual, certain information is not shared as it is beyond the scope of this paper, and it was not introduced at the outset of the methodology. Together with Janelle Baker, Martin Connors, and Barbara Martin we discussed the methodology. Baker is an Associate Professor in Anthropology whose mother is from the North Battleford Métis in northern Saskatchewan, and whose grandpa had mixed Native American ancestry from North Dakota and Nebraska. Auger and Baker have worked together on previous projects. Martin Connors is of Irish descent and Professor in Space Sciences and Physics who was asked to participate in the research to support its quantitative methodology. In the spirit of solidarity, we worked with Barbara Martin, a graduate research assistant, who identifies as an individual with Indigenous roots of the Tabajaras tribe—an Indigenous community in the northeast side of Brazil. This research was a training/mentoring opportunity for Martin who uploaded the online survey, and worked closely with Auger, Baker, and Connors to analyze the results. Martin worked alongside Auger to collect qualitative information from the Indigenous students.

The results section identifies Indigenous students' views of historical impacts on iyiniwak health, along with their reactions, experiences, challenges, barriers, and adaptations in the online learning environment during the pandemic. Education is one determinant of health (Reading & Wein, 2009) and having access to open online education is particularly important as it provides a sense of normalcy for Indigenous students living within their respective nations and communities, and also contributes to future health outcomes.

Literature Review

The pandemic triggered historical trauma of the catastrophic population decline that began in the year 1492, and "shrank" sovereign Indigenous nations on the American continent "from 112 million to approximately 5.6 million" (Sioui, 1992, p. 3). The cause of the American apocalypse was not only warfare,

but rather the epidemic diseases brought by the newcomers (Sioui, 1992, p 3). It was a major upheaval caused by microbial infections from Europe, (Sioui, 1992, xxiii). By the 19th century, the concept of the vanishing Indian myth emerged. "From the 17th century onwards smallpox, measles, influenza, dysentery, diphtheria, typhus, yellow fever, whooping cough, tuberculosis, syphilis, and various unidentifiable 'fevers' caused illness and death as they spread from person to person and from village to village" (Waldram et al., 1995, p. 44). Epidemic diseases brought by the newcomers led to the American apocalypse (Sioui, 1992). The catastrophic population decline was not entirely due to the battles for the continent.

Indigenous peoples died from smallpox-infected blankets and handkerchiefs passed to them from the British (d'Errico, 2020). After the Seven Years War, there was a siege at Fort Pitt (Pittsburg) by Pontiac after the French bowed to the British resulting in the 1763 Royal Proclamation. Pontiac's rebellion resulted in germ warfare spread by the British to the Indigenous peoples at the fort (d'Errico, 2020).

Infectious diseases continued to spread within colonial institutions Indigenous residential school survivors experienced tuberculosis epidemics because of neglect in Canada's residential schools (Waldram, 1995). The residential school syndrome refers to the experiences of people who attended the government-funded and church-operated schools. According to Brasfield (2001):

> For most people who attended Indian residential schools, there is no symptomology other than that similar to other people who have attended a boarding school for an extended period of time. However, for a significant minority of Indian residential school students, there is a symptomology quite similar to post-traumatic stress disorder. More specifically, there are recurrent intrusive memories, nightmares, occasional flashbacks, and quite striking avoidance of anything that might be reminiscent of the Indian residential school experience.
>
> At the same time, there is often a significant detachment from others, and relationship difficulties are common. There is often diminished interest and participation in aboriginal cultural activities and markedly deficient knowledge of traditional culture and skills. Often there is markedly increased arousal including sleep difficulties, anger management difficulties, and impaired concentration. As might be the case for anyone attending a boarding school with inadequate parenting, parenting skills are often deficient. Strikingly, there is a persistent tendency to abuse alcohol or sedative medication drugs, often starting at a very young age (Symptomology section, para. 17 & 18)

Left unhealed, intergenerational trauma affects subsequent generations of Indigenous peoples on Turtle Island whose forebears went to residential schools, as the experience was more than "an extension of traditional diagnostic categories," (Robertson, 2006, p. 8), the experience reflects genocide. In addition to the historical and intergenerational trauma, COVID-19 was a threat to all human life; and for the Indigenous students in this study, it triggered multiple reactions on a personal level and within their families, communities, and nations. The significance of this research was to understand how Indigenous learners felt during COVID-19.

Methods

Tobacco is sacred (Nechi Training, Research, and Health Promotions Institute, 2010). It is a cultural protocol among many Indigenous peoples, including the lead researcher. However, there was no tobacco or other cultural protocol offered for the students' time and sharing experience. The team did not offer tobacco to any Indigenous students because it was not budgeted and it did not fit with the online survey method, but prayers were said for the students and research team. This was Indigenous led research with Indigenous learners and aligned with the principles of Indigenous research methodologies.

While preparing for doctoral research, Shawn Wilson considered spirituality "as a key component of Indigenous peoples' healing" and developed a research question for Indigenous graduate students (Wilson, 2008, p. 29). Considering his discussions with Indigenous scholars, he "form[ed] a stronger relationship with this topic" (Wilson, 2008, p. 32) and with their combined thoughts and advice. As such, Wilson articulated an Indigenous research paradigm in his book *Research Is Ceremony* (2008, p. 32). The book referenced the principles of relationality that included respect, reciprocity, and responsibility (Weber-Pillwax, 2001). When we consider research as ceremony, we respect the sacredness of tobacco and iyiniwak customs based on sacred and natural laws.

Offering and praying with sacred tobacco is a demonstration of "respect for holistic knowledges" (Kovach, 2009, p. 58). "Scholarship on Indigenous science, in one manner or another, references the relationship with metaphysics through creation myths, philosophies on space and time, and an energy source that Indigenous people describe as the sacred" (Kovach, 2009, p. 57). Therefore, Indigenous researchers self-locate in accordance with tribal epistemology in respectful ways with or without tobacco; not all iyiniwak practice the ritual of tobacco offerings (Kovach, 2009).

If spirituality is "being alive well" as Brant Castellano (2018, p. 55) explains, then applying spiritual energy in Indigenous research encourages and supports being alive well. In the context of this research on COVID-19, this was significant for the purposes of asking students to identify how their studies were going during the pandemic and was also important to help us maintain or find peace and balance.

The iyiniwak students from across Canada shared their experiences in confidence and the spiritual energy fulfilled the research. The research started with a survey; the urgency of the pandemic required quick data collection and the budget was limited. Researching and abiding by social distancing measures involved the use of technology. The methodology in an online environment required access to the Internet and/or telephone for participation. The Athabasca University Research Ethics Board approved the research.

To inform students about the research we worked with the Athabasca University Research Centre, which sent e-mails on September 28, October 15, and November 3. Appendix A[i] includes questions and results for the online survey We collected survey data until November 13, 2020. We held meetings every two weeks through Microsoft Teams to review and discuss progress. Connors and Martin extracted and compiled the survey data.

After completing the survey, some iyiniwak students expressed interest in participating in the focus group and individual interviews, and Martin confirmed participation. We wanted to hear what iyiniwak students

had to say within a group and as individuals. Through Zoom, we bridged across geographic regions and time zones. Auger and Martin met with the students on November 17, 2020, Mountain Time. Thirteen people indicated they would join the online session. Seven people participated in it. Field notes supported the data collection in response to the focus group questions (See Appendix B[ii]). From November 20 through to December 16, 2020, individual telephone interviews were scheduled. Auger conducted 16 interviews. One individual declined and three chose not to respond to e-mails. Appendix C[iii] includes the open-ended interview questions.

It is important to note the experiences of graduate students within research settings. As a co-author, the graduate research assistant Barbara Martin reflected on her research experience indicating that a well-structured survey, designed questions, an appropriately managed focus group, coupled with well-conducted individual interviews, could lead to proper data collection and analysis of research questions. In this case, the research approach prompted the analysis and understanding of issues that COVID-19 generated amongst the online Indigenous learners.

Relationship

Through e-mail, the research team connected to iyiniwak students who were offered the opportunity to click the link to the online survey. This enabled a connection between the research team and iyiniwak students. The online survey link included a question for consent and an invitation for further participation if they were interested in the focus group, and/or individual interview. We communicated at a distance through e-mail, Zoom, and telephone. Listening is part of the oral tradition of iyiniwak cultures. Listening gave learners the opportunity to express what they were experiencing during the COVID-19 pandemic. Researchers listened to learner's thoughtful and heartfelt experiences of trying to learn and complete their academic programs during the global pandemic. Josie Auger asked them about their individual experiences within the context of their family, community, and nation. Interview participants received follow-up e-mails to confirm that their responses were recorded accurately.

Results

The information gleaned from the focus group, individual interviews, and survey are presented together to give context to the students' experiences. We present the results of the focus group first. To begin, the following is Martin's perspective of what she learned during the focus group:

> Indigenous communities were left vulnerable during COVID-19. The pandemic affected the learning of Indigenous students attending online programs. Indigenous communities look after their citizens. Many households were crowded because they were looking after a brother, a cousin, an uncle, or even a neighbor. The number of people sharing the same space doubled the homeowners' work and care, creating a shortage of time for them to study. I remember participants saying that they were taking care of family members, and such acts touched me deeply. Having an Indigenous root, I could understand why my grandma was always looking after us. This research

> brought back memories of my childhood and made me wonder how my grandma would behave if she were alive during the pandemic, and how my mom would thrive if she were attending her nursing degree during such times.

Themes included: (a) the effect of the pandemic in the online learning environment; (b) the dark spots, or effects of the pandemic on the learner and family; and (c) coping mechanisms. Before the pandemic, people who practiced their spirituality did so on an individual basis and with other people at ceremonial lodges, but COVID-19 affected the spiritual practices. Indigenous students mentioned that they had to adapt and some started to do more for themselves spiritually because of the social distance requirements.

The pandemic created chaos in the lives of students as they were helping family and nation members. University staff were working from home. More people were at home using the same computer with other family members, and this made Internet access difficult. Students needed to ask for extensions or deferrals. The stress of COVID-19 made it harder for students to absorb the course material. Students had computer fatigue. They were exhausted. There were backlogs at the university. The phone lines were down. E-mail responses were slower. Extensions were costly. Not all students knew that they could get a free extension. Although it was an unprecedented situation, and management could not hardly have been expected to be perfect, the poor response of the university itself resulted in an increase in stress for students.

These were the dark spots mentioned in the focus group and like the dark spots these are short extrapolations from students' experiences. Some students expressed feeling scared and were worried about the health of their children, parents, and family members who oftentimes had other health issues. Social distancing affected friendships as people were discouraged from socializing. Some people experienced employment layoffs. Food security was diminished some people were not able to afford food nor eat properly. The winter was bleak and depressing with very little to look forward to socially. Amidst the turbulence of the pandemic, one student mentioned increasing her Bible study. Another student mentioned the coming of the end of the world. Social distancing requirements affected how people grieved. Normally family and community members support the family of the deceased to pay their respects. Balance and harmony are important to many Indigenous peoples and during these difficult times, it was hard to find a balance. One student identified isolation like "being on an island." To summarize, we added to the described experiences and acknowledged that beneath the water, there is earth, and symbolically we still have a connection to all beings.

From a strength-based perspective, having a supportive partner made a difference to some students. Self-care was important and they took three times the self-care. Facebook and social media replaced in-person socializing. Full homes were sources of happiness, and a student mentioned living with nine people in one household. There was a feeling of solidarity. People were helping one another. People were careful using masks and remaining vigilant. People were proud of their efforts to stay the course. One student enrolled in an online herbal workshop and found that to be a real blessing. One said that it was about turning terrible things into good things through trials and tribulations.

Indigenous students said they wanted to complete their studies. They wanted to go to the ceremonies more often. One student said they stepped up their spirituality by doing ceremonies on their own, and intuitively shifting to a new path. Prayer is powerful. The pandemic helped students focus, read, and study.

During the one-to-one interviews Auger spoke to Elders, leaders, health care professionals, income tax specialists, administrators, essential service workers, child welfare workers, business owners, men, women, parents, expecting parents, grandparents living in urban, rural, and Indigenous communities who were taking courses. Many expressed learning about their culture and carrying it forward through the practice of smudging, gathering herbs, beading, and cooking bannock and wild meat.

The Indigeneity spectrum of students participating in this research was diverse, as expressed in the following comment during a one-to-one interview:

> I am visibly white, like I look white. My mom was . . . near full, except for the white blood that comes in the Métis lineage. … I grew up in a very traditional home. … In those days, I was too Indian to be white. Now that I own a business, I will have my master's degree, and I would say that I am relatively successful. … Now I am suddenly too white to be an Indian (laughs). … It is funny how people associate, First Nations or Indigenous people with what they perceive we should be. … I have a distinct perspective on things, but you know, people expect me to roll up on a horse with bright, long, beautiful braids. … The things that people think [are] . . . still very driven by stereotypes.

Coming to terms with one's indigeneity often involves facing trauma, "[My mom's] indigeneity equals trauma to her, and I didn't understand that so now I hear her stories, and I totally get the picture," said another student.

In conversation, some students considered historical diseases like smallpox and tuberculosis as weaponized against iyiniwak people. They identified the stigma of HIV. In academia, we have referred to the distal determinants of health affecting generations of Indigenous people and it is historical trauma (Reading & Wien, 2009; Yellow Horse Brave Heart, 2004). One student shared an experience:

> I am from an Indigenous family, of course, and in my mom's family, her dad had 13 brothers and sisters, and he lost 11 of them to tuberculosis. … My mom's family were originally from northern Saskatchewan, and the time that the tuberculosis outbreak was happening they had to move closer to Prince Albert to be closer to their kids who were in the hospital, and they ended up getting stuck there because that was when the Indian agent instituted the need to have . . . a pass or whatever to travel around. … So, we ended up getting stuck on the reserve that we now call home but that was not their original home. That is where my mom's family lives now, and still to this day other families on the reserves do not consider my family a part of the reserve, because they were not originally from there. But because of what was going on and, you know, residential schools and all that stuff they were required to stay there. They were not allowed to leave.

Not having a sense of belonging, connection, or acceptance to a community of origin because of historical trauma would prevent iyiniwak from being self-actualized human beings. The psychological theory on self-actualization developed by Abraham Maslow originates with Blackfoot tipi teachings (Heavy Head, 2018). The historical impacts are a reminder of the survival experience that Indigenous people must endure with COVID-19, just like everyone else on the planet.

Findings

We now discuss the more important findings of the survey. Some individual responses are aggregated to provide a more meaningful discussion.

Indigenous learners identified that their access to technology worsened in 32.9% of cases after social distancing came into effect, with 56% having very good access before. Addressing insufficient bandwidth in the Northwest Territories would help students in the online learning environment, said one student. In an interview, one student stressed that access to technology should be "made more democratized, or at least more accessible." To have access to education, Indigenous communities need access to updated technology. A student described his northern Alberta residence as located in "the Bermuda Triangle of non-service of Internet." Before social distancing, 92.4% of these distance education (DE) students had access to the Internet, which afterwards decreased to 70%. Students stated that, "with everybody working from home, the Internet slows right down" and "you would want to count on getting somewhere with assignments . . . and then oh no, the Internet is not working!"

Before social distancing began, 53.6% of students found they had very good or fairly good access to public buildings like libraries or the band office for studying, using computers, and writing exams. The closure of public buildings made it challenging and difficult for 53.6% of students "to do the work." Indigenous communities that implemented checkpoints made it difficult for 15.7% of the students to complete assignments. A First Nations leader and student added:

> Our community went into a lockdown in the middle of March. It immediately closed when they declared it a pandemic. … We did not have any kind of protocol in place; or a pandemic response plan. It was developed during the pandemic.

The first wave of the pandemic prompted immediate responses from all sectors. Athabasca University closed their buildings, re-located staff to work from home, and shut their phone lines—all at a time when Indigenous students needed to communicate. These actions affected students in several ways; 52.2% of students indicated phone line closure, and 33.6% identified staff working from home affected their ability to complete assignments, confirm enrollment required for financial loans, and talk to someone. There were mixed responses from annoying to favorable regarding the closure of university phone lines. Students adapted by using social media as a source of information. "I think everybody was scared," said a student.

The majority of Indigenous students' households, 63.6%, were not only competing for Internet and computer use, but other factors also made it challenging or difficult to complete assignments. Major factors included lack of childcare (48.6%) and overcrowded homes (63.6%). Lesser factors were Elders/seniors coming home from institutions (21.4%) and inability to manage financially (14.3%). Financial fluctuations affected the majority (53.6%). On a spiritual level, the pandemic affected mind, body, and emotions—34.3% were unable to manage, or for 57.14%, holistic management fluctuated. Many said they were not motivated.

The mantra "we are all in this together" expressed the sentiment for society to adapt and get through the pandemic, but during the first and second wave, adaptation was not unanimously apparent. On an individual basis, 37.1% of Indigenous students' attitudes completely adapted; 57.9% adapted partially, with

5% indicating they could not adapt. Behaviorally, 56.4% of Indigenous students experienced a complete change related to the social distancing measures; 40% had some change; and 3.57% did not change. Indigenous students commented on their families' attitudes as follows: 43.6% had a complete change, 51.4% had some change, and 5% had no change. They also responded that regarding their family's behavioral change to social distancing measures, 45.7% had a complete change, 50.7% had some change, and 3.6% had no change.

Discussion

We made three attempts to reach all the Indigenous students who volunteered to participate in this research. To accept the link to the survey required technology and an Internet connection. Some students may not have had access during the pandemic to participate.

Learning about Indigenous peoples and cultures is a way to translate knowledge and inform society that we, as Indigenous people, are adapting. Like other human beings across Turtle Island and around the world we reacted, responded, reflected, and faced our feelings about COVID-19 and the impacts together through online Zoom meetings. Hand-written notes captured the main points.

Although we did not have the opportunity to present cultural protocol in the focus group or individual interviews to ask the Indigenous students questions, the research was still conducted with respect, and spiritual energy was infused. The issue of following cultural protocols should become a point of discussion. Should a university enable Indigenous researchers to follow cultural protocols when engaging in research with Indigenous people? Do all tribes follow the customs of protocol and offer tobacco? If not, then what? Another question for universities, governing bodies, and Indigenous peoples: Should tobacco be offered in all Indigenous research contexts when an Indigenous research paradigm is followed? What happens to the culture when brought into a Western research setting? Indigenous sovereign peoples identified solutions to complex problems. Canadian government guidelines on research ethics have stated that such guidelines on ethical conduct are "offered in a spirit of respect. [They are] not intended to override or replace ethical guidance offered by Indigenous peoples themselves" (Government of Canada, 2022, para. 5).

We posit that listening is not a health innovation, but during a crisis, it is an innovative service for anyone suffering. An important premise of this research was applying spiritual energy to Indigenous research in the face of COVID-19, as it helped to establish the relationality to Indigenous students, and it helped the researcher to maintain or find peace and balance. During the pandemic, we were required to social distance, which destroyed hopes for social interaction. If we consider the view of Brant Castellano (2018) "spiritual health is a communal affair, and it is undermined by anything that assaults community vitality" (p. 55) then online research provides a space like a sharing circle for discussions that allow Indigenous students to express their feelings and share experiences.

Baldwin (1994) identifies the power of one circle as an ancient space where "leadership rotates, responsibility is shared, and each participant agrees to trust that there is something present that's larger than all of us" (p. 29). This virtual space was like a sacred circle of squares, a term Dr.'s Josie Auger and

Melissa Jay described in online support meetings with Indigenous students at Athabasca University after they located unmarked graves of Indigenous children at residential schools in British Columbia and thereafter. Furthermore, since holistic health, encompasses the "physical, mental, emotional, and spiritual dimensions," and four dimensions have "become a mantra in the discourse on Aboriginal well-being," (Brant Castellano, 2018, p. 55) then it is natural for iyiniwak to embrace their spirituality and customs.

Since Athabasca University uses a tutor model to engage directly with students through online forums, e-mails, and the telephone, these mechanisms provide opportunities for listening to students. Through this research, we obtained information and created dialogue on historical life and death impacts, as well as learners' reactions to current situations, experiences, challenges, barriers, and adaptations, as they pursued post-secondary education in the online learning environment.

McLoughlin and Oliver (2000) discussed the need for cultural localization with Indigenous peoples in Australia, "which means incorporating the local values, styles of learning and cognitive preference [and] going beyond surface level design considerations, to achieve culturally inclusive constructivist learning environments" (p. 58). Based on cultural conversations with Aboriginal and Torres Strait Islanders who experienced educational inequity in higher education in Australia, Reedy (2019) recommended the following:

- Education developers, academics, and others involved in online learning design should consider the impact of culture when making learning design decisions.
- Educational equity for Indigenous learners may be enhanced through the use of the learning design model and preliminary design principles proposed in this article.
- Non-Indigenous researchers may consider "yarning" as an ethical and culturally appropriate method for engaging in research with Indigenous people. (p. 132)

While culture is an important consideration for educational equity, it is recommended to use ethical and culturally appropriate methods for engaging in research with Indigenous people to discuss online learning design.

Symbols of animals figure prominently in Indigenous cultures in Canada, and Indigenous scholars use the animal symbols to share symbolic logic based on ancestral practices. Ottmann (2017) identified Indigenous access to Canadian post-secondary education institutions as the spirit of the new buffalo as explained by Stonechild (2006):

> In the past, the buffalo met virtually every need of the North American Indian, from food to shelter; this animal was considered to be a gift from the Creator, intended to provide for the peoples' needs. Today, elders say that education, rather than the bison needs to be relied upon for survival. (pp. 1–2).

Jacqueline Ottmann (2017) referred to the complexity theory of access, which is a discovery "that holds the potential for profound discoveries in the midst of time—past, present and future—that is definitely not linear" (p. 96). She drew attention to the gap that Indigenous students experience from elementary to post-

secondary, such as barriers that are systemic and have systemic roots. Ottman (2017) described how complexity theory is a "liminal space" (p. 96) where ideas for post-secondary education can benefit Indigenous learners.

Education is the pursuit of knowledge, and research using Indigenous research methods holds vast potential. Furthermore, as Linda Tuhiwai Smith (1999) explained, educational research supports self-determination:

> Self-determination in a research agenda becomes something more than a political goal. It becomes a goal of social justice which is expressed through and across a wide range of psychological, social, cultural and economic terrains. It necessarily involves the processes of transformation, of decolonization, of healing and of mobilization as peoples. (p. 116)

Without access to online post-secondary education, caused by the pandemic, the exposure of Indigenous undergraduate and graduate students to Indigenous research methods was lowered.

Lack of access to technology in remote locations during the pandemic made educational access and participation difficult. In this study, the students' responses varied. Some were able to complete their studies while others asked for extensions or dropped out. Understanding their unique needs during the stressful times was important not only for Athabasca University, but for Canadian society-at-large, because we are slowly fulfilling the 2015 Truth and Reconciliation (TRC) Calls to Action across this country.

Conclusion

We return to what Simpson (2008) wrote about the roles of New People and settlers. We as Indigenous and settler researchers stand in solidarity to demonstrate support for the New People during the COVID-19 pandemic, by listening to what Indigenous learners in distance education had to say about what they were experiencing. The survey methods we used here were Indigenous in nature to help revive language, philosophies, politics, and culture. Indigenous people have a worldview that allows Indigenous researchers to seek knowledge, interpret it, and explain it from their unique perspective. Indigenous people are maintaining the sacredness of that knowledge and reviving it, to acquire "visions of peace and justice" (Simpson, 2008, p. 14). As healthcare systems around the world are under strain, people are sick and dying, and families and communities are under duress, how would it be possible to find peace and justice? The universe heard the loud cry for justice for Black and Indigenous Lives Matter. Still, we return to the prophecy explained by Simpson (2008).

The spirit and intent of the prophecy requires settlers "to decolonize their relationships to the land and the Indigenous people, in order to build a peaceful and sustainable future" (Smith, 2008, p. 14). We continue to stand in solidarity with this prophecy. The Elders spoke about the prophecies and through those teachings we hope to find peace.

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[i] Appendix A: https://docs.google.com/document/d/1f6xq0qx2Q9NQZhy8D5kG3t62k_Ya6CiY/edit
[ii] Appendix B: https://docs.google.com/document/d/1f6xq0qx2Q9NQZhy8D5kG3t62k_Ya6CiY/edit
[iii] Appendix C: https://docs.google.com/document/d/1f6xq0qx2Q9NQZhy8D5kG3t62k_Ya6CiY/edit

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Measuring the Impact of an Open Educational Resource and Library e-Resource Adoption Program Using the COUP Framework

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Abstract

Grant programs that foster the use of open educational resources (OER) significantly reduce undergraduate student spending on textbooks per semester. The Zero-Cost Course Materials (ZCCM) grant program at the University of California, Merced (UC Merced), eliminated text costs and ensured access to course materials by replacing required commercial materials with OER and library licensed e-resources. The present study applies the COUP framework (cost, outcomes, usage, and perceptions) to evaluate the ZCCM program. The ZCCM program resulted in student cost savings and did not negatively impact student outcomes. Students in ZCCM courses demonstrated higher rates of course completion than students enrolled in previous sections. For the outcomes of final course grade, passing with a C– or better, and number of credit hours enrolled in, findings were comparable between the cohorts. Student usage and perception of course materials were gathered using a survey. Though students reported favorable views of zero-cost materials, they reported using them less frequently than commercial texts. This research contributes to a growing body of literature that confirms beneficial cost savings for students using zero-cost materials without jeopardizing students' success.

Keywords: open educational resource, OER, library e-resources, COUP framework, cost savings, student outcomes

Introduction

The formal designation of open educational resources (OER) at the UNESCO Forum on the Impact of Open Courseware for Higher Education in Developing Countries (2002) launched OER as a compelling alternative to commercial educational materials. The definition of OER as "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" encapsulates the growing open movements at the time, including open courseware, open learning solutions, open access publishing, and open licensing (UNESCO, n.d.). While the 2002 forum brought participants together to examine worldwide applications of MIT OpenCourseWare, participants left with a collaborative plan to evaluate, use, and develop OER "for the whole of humanity" (UNESCO, 2002).

Within the United States, the development, curation, promotion, and use of OER in higher education curricula has been bolstered by funding at the federal, state, and institutional levels. The U.S. Department of Education allocated $47 million in grant funding starting in 2018 through the Open Textbooks Pilot program (Allen, 2022), and according to the SPARC (Scholarly Publishing and Academic Resources Coalition) OER State Policy Tracker, 28 states have enacted policies to promote OER use within higher education or at the K–12 level (Allen, 2022). Higher education institutions have launched their own programs to encourage faculty adoption, adaptation, and creation of OER. EDUCAUSE Horizon Reports (Brown et al., 2020; Pelletier et al., 2021) identify OER as a key technology and practice expected to significantly impact teaching and learning in higher education.

Encouraged by the success of initiatives like the Zero Textbook Cost (ZTC) degrees at California Community Colleges and the freely available online learning materials via the MERLOT (Multimedia Education Resource for Learning and Online Teaching) project initiated at the California State University system, the University of California, Merced (UC Merced) Library, and the UC Merced Center for Teaching and Engaged Learning (CETL) launched the Zero-Cost Course Materials (ZCCM) grant program as a three-year pilot project to explore the benefits and impact of OER. The ZCCM initiative provides faculty with grants to support their use of OER and/or library e-resources in place of commercial texts to ensure students have day-one access to materials at no cost. Including library e-resources, such as e-books with unlimited simultaneous user licenses along with OER, under the umbrella term "zero-cost materials," provided faculty grant recipients with more flexibility when selecting alternatives to commercial texts. The grant program's focus on costs and timely access to materials addresses challenges reported by UC Merced students acquiring course materials and recognizes a majority Pell-eligible undergraduate student population (UC Merced, Institutional Research & Decision Support, 2022a).

While many factors inform a faculty member's selection of course materials, some hesitate to consider OER without more information about efficacy and quality (Belikov & Bodily, 2016). A growing body of research aims to assess OER's impact. OER research in higher education frequently measures one or more elements in the COUP (cost, outcomes, usage, and perceptions) framework developed by the Open Education Group. This shared schema allows for current and future OER research to be compared (n.d.-a).

The present study assesses the impact of the ZCCM grant program by applying the COUP framework to answer the following questions:

1. What are the student cost savings of using zero-cost materials in place of commercial materials?
2. What is the impact of using zero-cost materials on student success?
3. How does the use of zero-cost materials influence unit enrollment patterns?
4. How do students perceive the quality and value of zero-cost materials?

Literature Review

Effects of Textbook Costs

Between 2006 and 2018, the average price of a college textbook increased by 190% (Bureau of Labor Statistics, U.S. Department of Labor, 2023; Smith Jaggars et al., 2019). While textbook prices have plateaued over recent years, students continue to take action to minimize textbook costs. The most recent National Association of College Stores (NACS) Student Watch Report finds that despite course material spending averaging $339 per year, the lowest since NACS started tracking this data in 1998, one in four students still skipped purchasing at least one course text, and 11% of students have pirated course materials (National Association of College Stores, 2022). Over 87% of respondents taking the Florida Virtual Campus (FLVC) Student Textbook and Instructional Materials Survey reported that they pursued measures to reduce textbook costs, such as renting a digital copy (50.5%) or sharing books with classmates (17%). Over half reported not purchasing the text at all (Florida Virtual Campus, 2022).

Students have expressed concerns about their ability to succeed academically when they do not purchase textbooks required for their classes. Sixty-five percent of respondents to a Student Public Interest Research Groups (PIRGs) survey indicated that they chose not to buy course materials due to costs, and of those respondents, 94% expressed concerns that this decision would negatively impact their course grade (Senack, 2014). Over a third (32.4%) of FLVC survey participants believed that high textbook costs resulted in poorer grades, and 24.2% reported dropping a course due to high textbook costs (Florida Virtual Campus, 2022). Additional literature suggests that these actions are not uncommon. In Jenkins et al.'s study (2020), 56% of surveyed students reported that they did not buy a textbook for a course due to costs and later felt like it had hurt their class performance; 12% dropped a class due to textbook costs, and 9% attributed failing a class for the same reason. Textbook costs can also influence students' course selection and enrollment intensity (credit hour) decisions. In the FLVC survey, 38.5% of students reported not registering for a specific course, and 43.7% reported taking fewer courses due to textbook costs (Florida Virtual Campus, 2022).

Cost Savings

Instructors frequently point to student cost savings as the primary reason for adopting OER (Hilton III, 2020). Switching to an OER can quickly yield significant savings, especially in large enrollment courses requiring high-priced texts. Fialkowski et al.'s assessment of an OER program at the University of Hawai‘i

at Mãnoa calculated savings of $39,000 for 311 students in an introductory nutrition course within a single semester (2020).

Researchers have employed various methods to calculate the cost savings of replacing a commercial text with an OER. One widely used method multiplies the sticker price of the previously assigned commercial text by the number of students enrolled in the OER course. Though Cozart et al. (2021) used the sticker price method, they note that cost savings can be difficult to determine precisely and may be inflated since not all students will purchase a new textbook at the list price. When determining cost savings of OER initiatives from 600 courses across 120 institutions, SPARC researchers (along with David Wiley) developed a formula to account for student purchasing behavior. Their calculation averaged the most expensive version of a text with the least expensive version, representing the text's available format and delivery options, from which the cost of the OER, if any, is subtracted. In applying this formula, they determined $116.94 in cost savings per student when a commercial text was replaced with an OER (Nyamweya, 2018). Another method uses a standardized amount to represent textbook costs; the Open Education Network and Open Oregon Educational Resources both apply a rate of $100 per student to determine cost savings (Hofer, 2017).

Student Outcomes

Many studies assessing the impact of OER examine one or more of the following undergraduate student outcomes: course grades; passing with a C– or better; withdrawal, drop, failure, and course completion rates; and enrollment rates. They vary in terms of their methodologies, sample sizes, and ability to control for variables.

Final Course Grades

Researchers regularly, but not exclusively, use course grades as an indicator of student learning and success. Most studies find that students in OER courses have comparable learning gains (Clinton, 2018; Clinton & Khan, 2019), similar or better learning gains (Grewe & Davis, 2017; Suriano, 2023), differences that are not statistically significant (Allen et al., 2015; Croteau, 2017; Jhangiani et al., 2018; Ross et al., 2018; Winitzky-Stephens & Pickavance, 2017), or improved learning (Colvard et al., 2018).

In an analysis of final grades for eight courses at the University of Georgia from 2010 to 2016, students in OER courses had significantly improved course grades in contrast to students in non-OER courses (Colvard et al., 2018), while Fischer et al.'s examination of 15 undergraduate courses from 10 institutions found no significant differences in course grades between OER and non-OER courses when results were reported in aggregate. Robinson reported the opposite; students using OER had lower grades than those using commercial textbooks (2015). For data at the course level, results from Fischer et al. (2015) and Robinson (2015) were mixed.

Additional findings differ by student population. For instance, Winitzky-Stephens and Pickavance (2017) did not see a significant correlation between course grades and OER until they analyzed new first-year student and continuing student populations separately. When disaggregated, they found course grades positively impacted new students in OER courses. Colvard et al.'s (2018) research found that OER courses

had even greater positive impacts for Pell-eligible students, part-time students, and historically underserved students.

Passing With a C– or Better

When examining three measures of student success, including the likelihood of passing with a C– or better, Winitzky-Stephens and Pickavance (2017) found that there were no adverse effects for students using OER compared with students using commercial texts. Fischer et al.'s (2015) work also investigated if students in OER and non-OER groups were more or less likely to earn a C– or better. Results were mixed, though for most courses (9 of 15), there were no significant differences between the two groups. Five OER courses and one commercial course yielded higher rates of students passing with a C– or better. While Robinson (2015) found no statistically significant differences between OER and non-OER groups earning a C– or better, analysis at the course level surfaced two of seven courses in which the OER groups had lower rates of earning a C– or better. While findings are not entirely uniform, the literature predominantly reports positive impacts or no negative impacts of OER usage on students' ability to pass with a C– or better.

Withdrawal, Drop Rates, Failure Rates, and Completion Rates

Researchers have also examined students' withdrawal rates, drop rates, failure rates, and rates of completion in OER versus non-OER courses as additional measures of student success. Most findings point to OER as having positive impacts on these measures, while others report findings with no statistical significance or findings with mixed results. Numerous researchers report lower withdrawal rates of students in OER courses (Bol et al., 2022; Clinton, 2018; Clinton & Khan, 2019; Feldstein et al., 2012; Hilton III & Laman, 2012; Hilton III, 2016; Pawlyshyn et al., 2013; Suriano, 2023), lower drop rates (Hilton III, 2016; Wiley et al., 2016), lower failure rates (Colvard et al., 2018; Feldstein et al., 2012), and higher completion rates (Ross et al., 2018).

Additional studies record a lack of statistically significant differences between the rates of OER and non-OER groups. Winitzky-Stephens and Pickavance (2017) found no statistically significant differences in withdrawal or pass/fail rates between students in OER and non-OER classes. Croteau (2017) concluded that there were no differences in either DFW (drop/fail/withdraw) or completion rates between students in courses pre- and post-OER adoption. Fischer et al. (2015) also compared completion rates of students in OER and non-OER sections in 15 courses and found few significant differences.

Enrollment Rates and Enrollment Intensity

There is a limited amount of literature on OER's potential impact on student enrollment patterns. Some studies highlight students' avoidance of classes due to textbook prices, and these costs may also have a greater impact on certain student populations. In their survey of students enrolled in a general psychology course, Hardin et al. (2019) found that non-White students and first-generation college students (FGCS) "reported that the cost of the book had a significantly higher impact on decisions to enroll in the course" in comparison to their non-FGCS or White peers; yet, the study's larger conclusion pointed to textbook costs having a minimal effect on students' decisions to enroll in courses of interest (p. 54). Similarly, Jenkins et al. (2020) reported that 27% of their student respondents avoided enrolling in a class due to textbook costs, and this rate of avoidance increased for Latinx and transfer students. Other studies have gone beyond student survey data to examine enrollment rates and enrollment intensity (the number of credits in which

a student is enrolled each semester). In both cases, Fischer et al. (2015) and Robinson (2015) found that students enrolled in OER courses had a higher credit load on average.

Student Use and Perception of OER

Students have reported using OER at similar rates to commercial texts (Bliss et al., 2013; Hendricks et al., 2017; Jhangiani et al., 2018; Sack Illowsky et al., 2016). Gurung's results (2017) differ, finding that students using OER read less than those using a commercial textbook.

In regards to OER quality, students are usually positive. When asked to compare the quality of an OER to that of commercial texts they had used previously, the majority of students in multiple studies responded that the OER was of better/higher or equal/similar quality to commercial texts (Bliss et al., 2013; California Open Educational Resources Council, 2016; Cooney, 2017; Hendricks et al., 2017; Hunsicker-Walburn et al., 2018; Ikahihifo et al., 2017; Jhangiani et al., 2018; Ross et al., 2018; Sack Illowsky et al., 2016; Watson et al., 2017). This finding is highlighted in Hilton's synthesis of user perceptions of OER from 2015 to 2018 (Hilton III, 2020) and in Mullens and Hoffman's 2023 systematic review of OER publications from 2002 through 2023, which included 48 studies that investigated student perceptions of OER quality. Additional studies indicate no significant differences in students' perceptions of OER and commercial texts (Clinton, 2018; Nusbaum et al., 2020), while a limited number of studies report that students rated their standard commercial texts as higher quality than OER (Gurung, 2017; Lawrence & Lester, 2018).

Some studies have identified what students value about OER. Desirable characteristics include ease of use (Hilton III & Laman, 2012), ease of access (Brandle et al., 2019), greater readability (Jhangiani et al., 2018), better writing (Clinton, 2018), targeted content, organizational flexibility, and digital capabilities (Cooney, 2017; Ikahihifo et al., 2017).

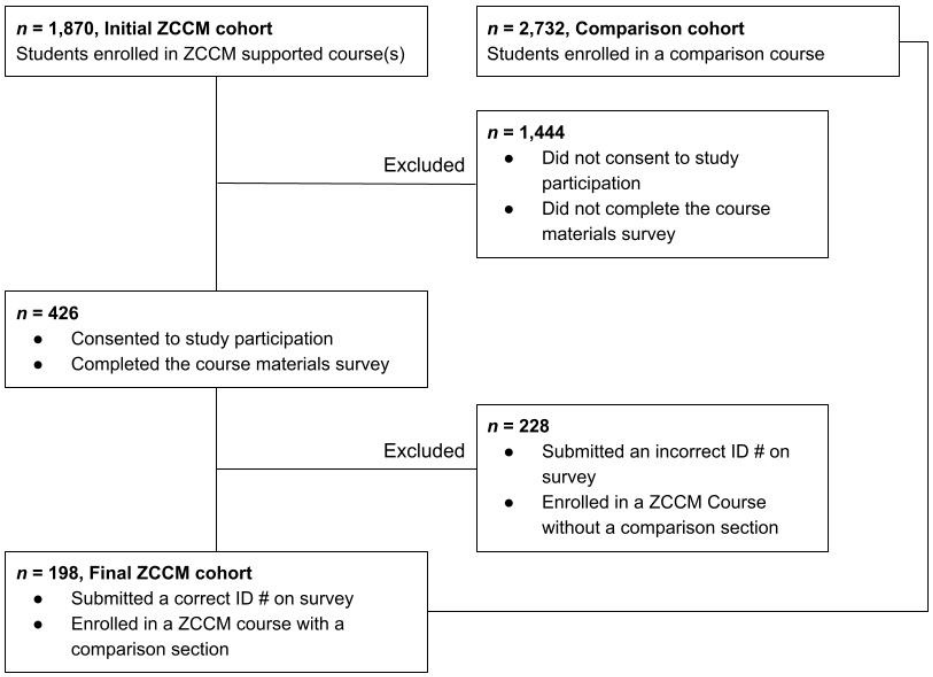
Methodology

Participants

During the grant program, 1,870 students were enrolled in one or more ZCCM-grant-supported courses, which included large enrollment introductory courses, upper division courses, and one graduate level course. At each semester's end, students in ZCCM courses were invited to complete a survey and consent to the release of specific student data to be linked to their survey responses. Of those enrolled in a ZCCM course, 426 provided their student ID number and completed the survey. The students who correctly recorded their ID number on the survey and were in a ZCCM course that could be matched to a comparison section comprised a treatment group of 198 students (ZCCM cohort; see Figure 1). Their survey responses were linked with demographic data and student success indicators. The same set of demographic data and student success indicators were obtained for a control group of 2,732 students (comparison cohort) who were enrolled in a prior offering of the course from the same instructor when commercial materials were required.

Figure 1

Cohort Eligibility Flowchart



Data Collection

We worked with UC Merced's Institutional Research & Decision Support (IRDS) and campus registrar to obtain final grade data, drop and withdrawal rates, and credit unit enrollment intensity. We obtained demographic and background data for students in both treatment and control groups, including gender, race/ethnicity, field of study (student major), year of study, grade point average, on-campus housing/commuter status, and first-generation college student status. For analysis, final grade data were recoded from a letter grade into a four-point scale, in which an F grade was valued at 0 and A and A+ grades valued at 4. Students' course drop, withdrawal, and failure rates were used to calculate course completion. Student self-identified race and ethnicity data were categorized using Integrated Postsecondary Education Data System (IPEDS) classifications and described at the highest specificity that maintains student privacy. These variables were collected to control for non-treatment effects and differences between the cohorts, and we hoped to learn if any student populations had positive or negative outcomes based on zero-cost material or OER usage (Colvard et al., 2018; Nusbaum et al., 2020).

The survey asked ZCCM students about their use and perceptions of course materials (including zero-cost materials), their textbook purchasing behavior, and textbook costs. The survey was developed by reviewing surveys from the literature (Bliss et al., 2013; Dastur et al., 2015; Open Education Group, n.d.-b). Researchers obtained an exempt approval for this project from the UC Merced Institutional Review Board.

Data Analysis

Demographic data describing the treatment and control groups were compared using a chi-squared test or t-test to identify significant differences between the groups. To examine the impact of zero-cost materials on final grade, final grade of C– or higher, enrollment intensity, and course completion, we applied a doubly robust (DR) treatment effects model with an inverse-probability-weighted-regression-adjustment (IPWRA) estimator, a statistical technique applied to estimate the effect of an intervention while effectively minimizing the selection bias via modeling the selection process and outcome mechanism simultaneously (Dudik et al., 2011; Funk et al., 2011; Hall et al., 2015; Wooldridge, 2010). Prior research found that such an approach consistently estimates the unbiased average treatment effects if the propensity score model or the outcome model is correctly specified (Bang & Robins, 2005; Sant'Anna & Zhao, 2020; Tan et al., 2022). All the DR models matched and controlled for students' gender, race/ethnicity, on-campus housing/commuter status, first-generation college student status, major of degree, and semester. We analyzed survey data to examine students' experiences and perceptions of zero-cost materials as compared with commercial texts using descriptive statistics, chi-squared tests, or t-tests. STATA 17 was used for all of the analyses.

Results and Discussion

Cost Savings

Between 2019 and 2021, the ZCCM grant resulted in student textbook savings of $202,899. This estimate uses the sticker price method to calculate savings for the total number of students enrolled in the 15 grant-supported courses. The highest cost savings were generated by two introductory courses: Biology 001 and Economics 001. Biology 001 enrolled 515 students and previously used a textbook that cost $81. Though Economics 001 enrolled about half that number of students, its prior textbook was $248. Cost savings are reported for the first semester in which zero-cost materials were implemented and do not represent continued savings over subsequent semesters.

Survey data point to the importance of cost savings for students. Ninety-one percent of student survey respondents indicated that potential cost savings of course materials are moderately to extremely important. During course registration, grant-supported courses were listed with a "no textbook costs associated with this section" label. Of the 24% of students who indicated seeing this label, 64% reported that this statement influenced their decision to register for the section. Students were later asked to imagine a future course with two identical sections, one using zero-cost materials and the other section using commercial texts. Eighty-four percent of students indicated that they would enroll in the section using zero-cost materials, with 15% indicating no preference and 1% preferring the section using commercial texts.

Cohort Comparison

Before analyzing impacts on student outcomes, we ran descriptive statistics for both groups, which are displayed in Table 1. The ZCCM and comparison cohorts were found to be largely comparable, with no significant difference by gender, race/ethnicity, on-campus housing/commuter status, school year, or number of credit hours. However, students in ZCCM classes were less likely to be first-generation college

students (p = .027). There were some differences in the declared major between the two cohorts; for example, the comparison cohort comprised a larger proportion of students majoring in biological sciences.

Table 1

Demographic Characteristics by ZCCM Treatment Group Versus Comparison Group

	Comparison (n = 2,732) N (%)	ZCCM (n = 198) N (%)	p-value
Gender			.199
Male	1,462 (53.5)	119 (60.1)	
Female	1,254 (45.9)	78 (39.4)	
Declined to state	16 (0.6)	1 (0.5)	
Race/ethnicity			.075
International	184 (6.7)	17 (8.6)	
Hispanic	1,515 (55.5)	94 (47.5)	
Asian	566 (20.7)	44 (22.2)	
White	224 (8.2)	28 (14.1)	
Combined racial groups	222 (8.1)	15 (7.6)	
Unknown	21 (0.8)	0 (0)	
First-generation college student	1,992 (72.9)	130 (65.7)	.027
On-campus housing/commuter	1,256 (46.0)	95 (48.0)	.584
Major*			< .001
Unknown	117 (4.3)	9 (4.6)	
Bioengineering	122 (4.5)	16 (8.1)	
Biological sciences	852 (31.2)	13 (6.6)	
Chemistry	86 (3.2)	5 (2.5)	
Computer science and engineering	354 (13.0)	42 (21.2)	
Management and business economics	243 (8.9)	37 (18.7)	
Mechanical engineering	442 (16.2)	41 (20.7)	
Psychology	103 (3.8)	3 (1.5)	
Other	413 (15.1)	32 (16.2)	
Graduation year			.096
2018	257 (9.4)	9 (4.6)	
2019	1,341 (49.1)	99 (50.0)	

2020	970 (35.5)	80 (40.4)	
2021	164 (6.0)	10 (5.1)	
Grade point average, *M* (*SD*)	2.9 (0.6)	3.0 (0.5)	< .001

**Note*. The sum of the percentages may not round up precisely to 100 due to the precision of one-digit decimals.

Impact on Student Outcomes

When matched and controlled for student demographics and characteristics to isolate the treatment effect, students in the ZCCM group had outcomes that were better and no different than those in the comparison group, as summarized in Table 2.

Final Course Grades

The control and treatment groups did not differ in final grade (p = .091). These comparable or similar final grades align with the literature (Clinton, 2018; Clinton & Khan, 2019; Grewe & Davis, 2017). Since the same instructor taught the courses compared, one might expect little fluctuation in final grades despite different course materials being used. This finding may suggest that instructors' selections of course materials were not significantly inferior or superior to their prior choices.

Passing With a C– or Better

No differences were found between ZCCM and control groups in the attainment of a final grade of C– or above (p = .076), which is similar to what studies with aggregated findings revealed (Robinson, 2015; Winitzky-Stephens & Pickavance, 2017). As with final grades, instructor consistency across comparison groups may have contributed to this finding. Grimaldi et al.'s 2019 work would expect this outcome. Their access hypothesis suggests that OER primarily benefits a subset of students who would not have purchased the course text due to the expense; therefore, any positive learning outcomes from OER adoption impact a smaller group of students and are unlikely to yield a measurable effect.

Course Completion Rates

In our statistical analysis, there was evidence that students enrolled in ZCCM courses had higher course completion rates (p = .002) than their peers in the control group. This finding was significant, though the effect size was small. This result aligns with the majority, though not all, of the literature on OER and course retention. However, this finding is not strongly supported by our survey data. Almost 92% of respondents reported that they had never (80.11%) or rarely (11.83%) dropped or withdrawn from a course due to the cost of the course texts. Still, this finding suggests that textbook costs may compromise students' ability to complete a course.

Table 2

Student Outcomes by ZCCM Treatment Group Versus Comparison Group

Outcome measures	Cohorts			Mean level for comparison cases		Average treatment effects	
	Comparison group	ZCCM group	*p*-value	Est. [95% CI]	*p*-value	Est. [95% CI]	*p*-value
Final grade, *M* (*SD*)	2.71 (1.03)	3.06 (0.79)	< .001	2.68 [2.63, 2.73]	<.001	0.11 [−0.02, 0.23]	.091
Final grade C– or better, *N* (%)	2,360 (77.4)	205 (88.4)	< .001	OR:2.48 [2.44, 2.51]	<.001	OR:1.05 [0.99, 1.10]	.076
Credit hours enrolled, *M* (*SD*)	15.22 (1.79)	15.21 (1.88)	.972	15.02 [14.92, 15.11]	<.001	0.20 [−0.15, 0.54]	.263
Course completion, *N* (%)	2,782 (91.2)	217 (93.5)	.230	OR:2.42 [2.38, 2.46]	<.001	OR:1.06 [1.02, 1.10]	.002

Credit Hours Enrolled

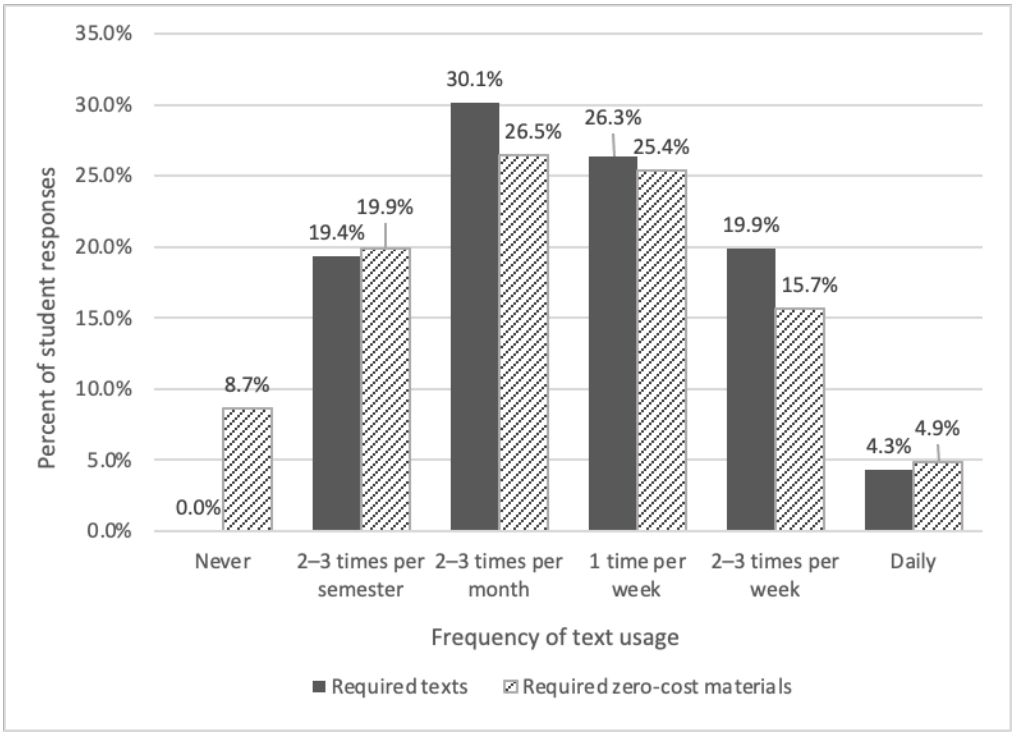
The two groups (p = .263) did not differ significantly in the number of credit hours enrolled, suggesting that students in ZCCM courses were not compelled to take on more credit hours due to the reduced cost of course materials, even though 20% of student survey respondents indicated that they had previously enrolled in fewer units due to the cost of the course text, and studies have found that students taking an OER course have, on average, enrolled in a higher number of units in contrast to a control group of peers (Fischer et al., 2015; Robinson, 2015). Other factors may be more influential in students' enrollment decisions. A campus survey asked first-year students to report why they had enrolled in fewer than 15 units, and the most common reason (47%) was a lack of open seats in the section(s) needed (UC Merced, Institutional Research & Decision Support, 2022b). Other factors influencing enrollment choices may revolve around times courses are offered, perceived course difficulty, or commitments to activities such as employment or student research.

Student Use and Perception

ZCCM students were surveyed about their usage of required texts in their courses overall as compared with their usage of required zero-cost materials in their grant-supported course (see Figure 2). Students reported using the required texts in their other courses more frequently than they reported using zero-cost materials (3.7 [SD:1.2] vs. 3.4 [SD:1.4], p < .001). Fifty-one percent of respondents indicated that, on average, they used their required texts once a week or more, as opposed to 46% of students who reported using required zero-cost materials at the same frequency.

Figure 2

*Frequency of Text Usage in All Courses Contrasted With a ZCCM Course**



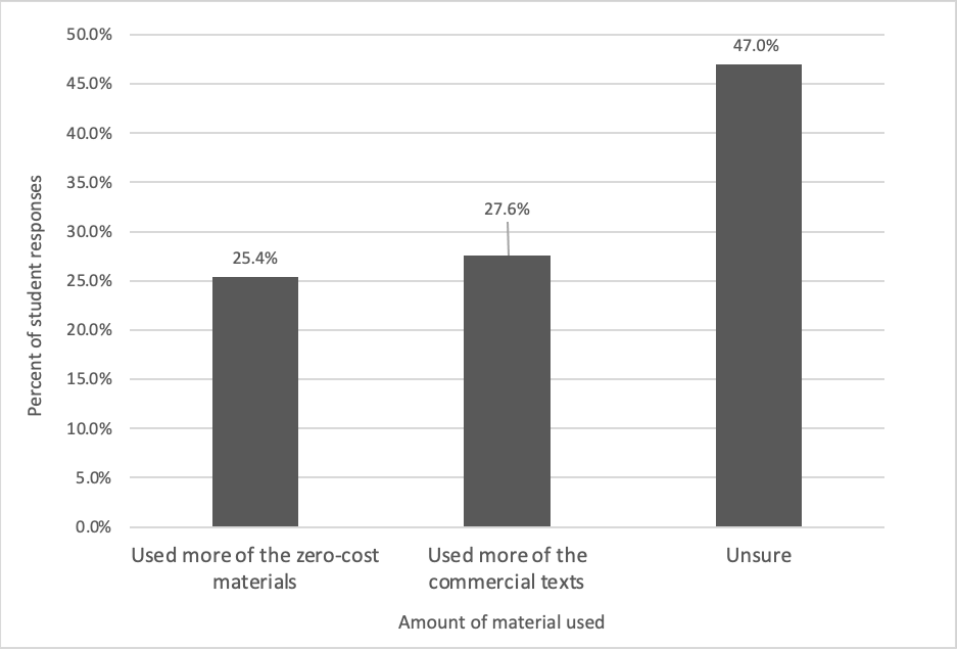
**Note*. The sum of the percentages may not round up precisely to 100 due to the precision of one-digit decimals.
n = 198

Gurung's 2017 analysis highlights a similar finding, in which students reported reading and studying less when using OER versus commercial textbooks. Gurung suggests this difference can be attributed more to student engagement patterns with print versus online materials than to the quality of the content. There may be several reasons students reported using zero-cost materials less frequently than the texts in other courses, such as zero-cost materials being adapted or created specifically to support in-class lecture and activities, or the implementation of zero-cost materials coinciding with fewer assessments that relied on course readings.

When asked about the percentage of materials used, 28% of students reported using a larger amount of commercial texts than zero-cost materials, while 25% reported using a larger amount of zero-cost materials than commercial texts. Forty-seven percent selected "Unsure" in response to this question. See Figure 3 for a summary of student responses on material usage.

Figure 3

Amount of Materials Used

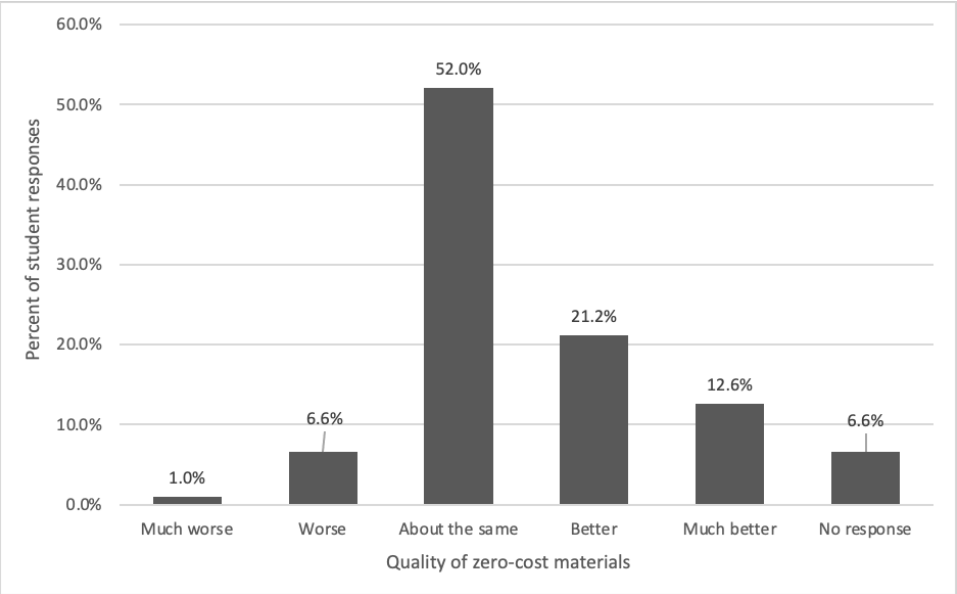


n = 198

Students were also asked to rate the quality of the text(s) used in the zero-cost materials course in contrast to texts in other courses (see Figure 4). Over half of the students (52%) thought the zero-cost materials were of similar quality to other texts with costs while 33.8% reported that they were of better or much better quality, and under 8% of students reported the quality of the zero-cost materials as being worse or much worse.

Figure 4

Students' Ratings of Quality of Zero-Cost Materials Compared With That of Commercial Texts



n = 198

ZCCM students' positive perception of zero-cost materials aligns with the literature, in which the majority of students surveyed have expressed favorable views of OER quality (Hilton III, 2020). While Jhangiani et al. (2018) propose that the free nature of OER can provoke a halo effect on quality ratings, these positive perceptions may also be driven by desirable features found in freely available resources (Brandle et al., 2019; Hilton III & Laman, 2012; Jhangiani et al., 2018). When asked about features of zero-cost materials, students indicated that the ability to access materials immediately (91%) and the convenience and portability of the digital format (87%) was moderately to extremely important.

In addition, students were asked to compare their experiences in the ZCCM course to those in previous courses. A small percentage of students reported negative impacts associated with the ZCCM course, while most students noticed a positive or neutral effect, as summarized in Table 3. In their systematic review, Mullens and Hoffman (2023) note six studies that found an increase in student engagement. The authors caution that engagement is not well defined through self-reported measurements but stipulate that access to materials and interactive features of OER could be driving engagement. Another driver could be changes in instructors' pedagogical approach, associated with their adoption of OER.

Table 3

Experiences in Zero-Cost Courses as Compared With Previous Courses

	Decreased	Increased	No change	Unsure
Participation in classroom discussions	3.26%	38.04%	50.00%	8.70%
Interest in the subject	2.72%	45.11%	45.65%	6.52%
Satisfaction with the learning experience	3.80%	52.17%	37.50%	6.52%
Grades	4.89%	44.57%	37.50%	13.04%
Engagement with lesson content	5.43%	51.09%	35.33%	8.15%
Engagement with readings	4.89%	40.76%	45.65%	8.70%
Collaboration with peers	4.89%	44.57%	41.85%	8.70%
Completion of course readings	4.89%	42.93%	44.02%	8.15%

n = 198

Limitations and Future Directions

Though we used the DR estimator to address potential selection bias in this observational study, some bias may be present due to recruitment challenges, which became more difficult when classes pivoted to online instruction in March 2020 due to COVID-19. This resulted in uneven levels of student participation across grant-supported courses. For example, biological science majors comprised 6.6% of our ZCCM cohort, while they made up 31.2% of the comparison group.

Many students who consented to participating in this research project incorrectly entered their student ID numbers on the survey, which prevented us from matching many survey responses to student data. This limited our ability to perform more granular analyses of the impact of zero-cost materials on specific

student groupings, such as historically underrepresented students. Furthermore, this study only compared courses taught by the same instructor and did not account for variations in learning experiences (e.g., in-person vs. online). The current study did not attempt to assess the potential effects of the zero-cost material type (e.g., open textbooks, course-specific materials authored by the instructor, library e-resources) or how the instructors used the materials with their students. For future assessments, we plan to obtain students' Pell Grant eligibility to examine how this group of students who qualify for low-income aid may be impacted by textbook costs and the use of zero-cost materials.

Conclusion

Our research using the COUP framework contributes to a growing body of literature confirming beneficial cost savings for students using zero-cost materials without jeopardizing students' success. Students in our ZCCM cohort had higher course completion rates than their comparison group of peers, and no differences were found between these cohorts in final grades or passing with a C– or better. In addition, enrollment intensity did not vary. These results can alleviate any local concerns about the efficacy of using OER and/or library e-resources in course curricula. Though students' perceptions of zero-cost materials were positive, more investigation is warranted into why students may have used these materials less frequently than other texts. Usage may have been impacted by the challenges related to unexpected distance education, a primary mode of instructional delivery for some of the classes in this study. While this less frequent engagement with the materials did not seem to negatively impact students' academic success, it reminds us of the multiple dimensions that contribute to student learning and the need for additional research to uncover what elements of zero-cost materials—whether they are OER or library e-resources—may facilitate student learning. Also of concern, and another area for further study, is the potential impact of textbook costs on historically underserved student populations. These populations may be the ones most likely to lack access to course materials. Feedback from students confirms that they pay attention to textbook costs and seek to avoid or minimize them. Using zero-cost materials relieves some financial burden from our students while still supporting their academic success. These positive outcomes should encourage institutions, librarians, and faculty to strongly advocate for the use of OER and/or library e-resources in course curricula. Ongoing work should also consider how to promote further integration and engagement of course materials in curricula.

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Student Support in Online Learning—We Need to Talk About Money

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Abstract

Online higher education has been a success in part because it is less costly to students and governments than conventional education, so both students and governments receive higher returns on their investment than in conventional higher education. However, many online institutions appear to have considerably lower graduation rates than conventional education—the so-called online education deficit that reduces its advantage. This deficit can be reduced through online education institutions investing money in both their course design strategies and their student support, including teaching. This article focuses on student support and suggests that if support increases student retention, institutions will receive a financial return through increased income. It argues: if that increase in income can then be managed to be greater than the original investment, institutions will make a positive return on the investment—that is, a surplus. That surplus can then be reinvested in further student support and potentially increase student success still further. The article then determines what those returns on investment might be in various scenarios depending on institutional funding arrangements. These determinations produce a series of formulae in which actual financial figures can be substituted to calculate those returns.

Keywords: dropout, attrition, online education deficit, graduation rates, benefits and costs, returns on investment, student retention, money

Student Support in Online Learning—We Need to Talk About Money

Some years ago, the late professor Sir Eric Ashby, FRS (1904–1992), writing about how university academics make decisions, said,

> All over the country groups of scholars, who would not make a decision on the shape of a leaf or the derivation of a word without painstakingly assembling the evidence, [nevertheless] make decisions about admission policy, staff–student ratios, content of courses and similar issues, based on dubious assumptions, scrappy data and mere hunch. (as cited in Brown, 2005, p.3)

At that time, Sir Eric (later Lord Ashby), a scientist by training, was vice-chancellor of Cambridge University. If he were alive now, he would have to admit that we have a great deal more evidence about online education through developments such as learning analytics. But he might still have reservations about how that evidence is used in practice. In particular, he might maintain that his comments still apply to the question of how online education institutions use their most important resource—money.

He might point to a quote from a recent report from the Organisation for Economic Cooperation and Development (OECD) on *Resourcing Higher Education: Challenges, Choices and Consequences*:

> Systematic evidence on the cost effects of digitalising course development, delivery, and assessment is limited—and, for many, disappointing. Contrary to expectations, many digitised courses have had comparable costs to in-person instruction … Online teaching is just as expensive as in-person instruction. (OECD, 2020, p. 45)

He might also note that another part of the OECD report also found that, while real expenditure per student doubled between 1995 and 2015, student numbers have grown by only 81% (OECD, 2020, p. 30). So, not only may productivity in higher education have not increased; it may actually have fallen, despite the increasing use of online teaching.

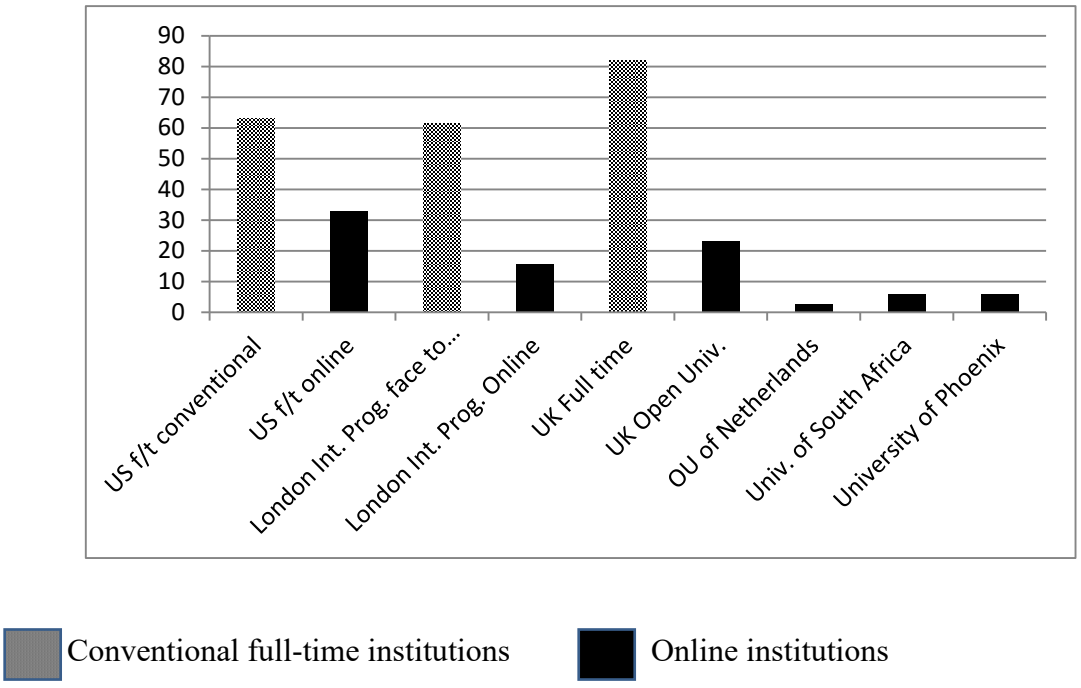
Much attention has of course been paid to the finances of online higher education by authors such as Rumble (2001, 2014), Bramble and Panda (2008), Demiray and Sever (2011), Daniel et al. (2009), Hulsmann (2004), and others. These studies have analysed the complexities of institutional finances, often in considerable depth. However, relatively little attention has been given to how online institutional funding might be used in actual practice to address a fundamental characteristic of higher online education—its high levels of student dropout or attrition compared with conventional higher education. As Karl Marx famously wrote, “The philosophers have only interpreted the world, in various ways. The point, however, is to change it.” This article attempts to understand how an institution’s money might be effectively applied to overcome this dropout rate. To do that, it first looks at the scale and consequences of that dropout.

Dropout and Attrition in Online Learning

Dropout figures can be complex to define. Higher education institutions can measure their dropout rates in many different ways, students may opt for intermediate qualifications in default of degrees or take lengthy periods to finish, and data are often very hard to both discover and compare. However, since most benefits of online education may accrue after graduation, graduation or completion rates may be the most significant and comparable measure. But such figures can be hard to find. Figure 1 shows a few that have been published compared with two UK face-to-face higher education figures.

Figure 1

Comparison of Conventional and Online Education Graduation Percentage Rates



Note. Adapted from "Online Options Give Adults Access, but Outcomes Lag" by D. Ledermann, *Inside Higher Education,* June 19, 2018 (https://www.insidehighered.com/digital-learning/article/2018/06/20/online-education-gives-adults-access-student-outcomes-lag#.WypGgexaCY8.twitter) and *Supporting Students for Success in Online and Distance Education* (p. 7), by O Simpson, 2012, Routledge. Copyright 2012 by Routledge.

Online education graduation rates are noticeably lower than the figures for graduation from face-to-face education. Admittedly, some of these data are quite old. However, a Freedom of Information request to the UK Open University by the author in January 2021 revealed that its more recent graduation rates are still of the order of 23%. And more recent studies confirm that online graduation rates have not only not improved but in some cases have actually decreased (e.g., Bawa, 2016; Delnoij et al., 2020; Hamann et al., 2021; Muljana & Luo, 2019; Sorensen & Donovan, 2017).

The figures for the University of London International Programmes are particularly interesting, as identical courses are presented in both face-to-face and purely online modes. So the graduation difference between the face-to-face and purely online modes (some 46% points) may be mostly due to

the factor of being purely online. There is also a difference of 16 percentage points between the UK Open University's graduation rate (23%) and the UK conventional face-to-face part-time graduation rate (39%), whose students may be comparable with online students, thus possibly experiencing similar study constraints. This difference has been termed the "online education deficit" (Simpson, 2012).

The Consequences of Dropout for Students

Evidence indicates that UK full-time students who have dropped out experience markedly higher probabilities of depression, unemployment, debt, and (for women) partner violence than both graduates and people who never went to university at all (Bynner, 2001). Little research has been conducted into students who dropout of online education despite the large numbers who do so. It may be that the personal, social, and financial effects of dropping out of an online course are less serious than the consequences of dropping out of a full-time course, as the students' commitment may be less. But there is little evidence either way.

Consequences of Dropout for Online Institutions

The online education deficit may have consequences for institutions themselves. Where governments support online education, will they be content to continue to fund such an apparently relatively inefficient form of learning? The answer in the United Kingdom may lie in the UK Office for Students (UKOfS), which, in 2022, announced a "consultation on a new approach to regulating student outcomes" (UKOfS, 2022, p.6). The UKOfS has very considerable powers in regulating UK universities in terms of financial grants and fines, allowing universities access to government-funded student loans, and even denying the title of "university" to higher educational institutions. In its consultation, the UKOfS proposes to set indicators that every university must reach in continuation, completion, and progression. In discussing the delivery of "positive outcomes for students," it noted that it would "set increased, more challenging, numerical baselines that apply to each indicator and all providers. We propose that numerical baselines will not be adjusted to take account of differences in performance between demographic groups" (UKOfS, 2020, p.4). The baseline announced for part-time student completion then was 55%. More recently, as a result of consultation, the UKOfS has made some changes in its proposals. The most important for part-time students is that the completion baseline has been reduced to 40% (UKOfS, 2022) which still compares unfavourably with the UK Open University's (UKOU) current completion rate of around 23%. The UKOU will probably argue that around a third of its intake may have less than conventional UK university entry qualifications and that some of its students settle for intermediate qualifications such as diplomas. How effective these arguments will be with the UKOfS remains to be seen, given the office's apparent determination not to adjust baselines any further. In addition to this challenge, the UK's Department for Education (2022) recommends in a more recent consultation that UK universities should quote their graduation rates in their advertising. This has not yet been made mandatory, as the department is waiting to see what the effects of this proposal are. But it has made it clear that it is willing to make the rule compulsory although it has not yet done so. The effect of having to advertise a graduation rate of 23% on UKOU student recruitment can hardly be positive.

If the approaches of the UKOfS and Department for Education were to be copied elsewhere around the world, this could have negative effects on many online educational institutions. Whether online education institutions are funded directly by governments or indirectly through student loan schemes, having high dropout rates may affect their incomes. Drops in income may then force cuts in staffing

and services to students, leading to a negative cycle of increasing dropout. The resulting financial problems could then lead to closure. For example, in 2016, the Obama administration stripped federal recognition of the accreditor responsible for two large chains—ITT Technical Institute and Corinthian Colleges—whose collapses drew attention to issues of misrepresentation and poor student outcomes within the sector (Cohen, 2016).

Subsequently, the US Department of Education said it would publish information about higher education institutions placed on probation by accreditors and post standards used to judge institutions. It would list student outcomes, such as graduation rates and loan defaults, by accreditor and encourage the agencies to consider poor outcomes in the approval process (Danielle, 2015).

No publically funded institution in the UK has yet been allowed to close by the government, although there have been some close calls and some forced mergers. However, a survey (Hunt & Boliver, 2021) has shown that 198 of 564 private higher education providers in the UK closed in the years 2014–2019. While their closures occurred for a variety of reasons, ultimately, financial reasons were at the heart of most terminations.

So, will students continue to enrol in online courses with high dropout rates indefinitely? Will such students be more attracted to other forms of education that offer considerably better chances of graduating, or can online education institutions increase their retention rates to more competitive levels? The effect of the online education deficit on some institutions might be existential.

Improving Online Education Graduation Rates

Online educational institutions might have two main approaches to improving their graduation rates:

- writing more retention-friendly online courses, or
- investing in student support systems.

Both these approaches will be important; this article focuses specifically on student support. When discussing student support, this paper will use the following definitions (Simpson, 2012):

- academic (or cognitive) support: teaching supplementing the online course material content; and
- nonacademic (or affective and organisational) support: every other kind of support.

Support can be reactive—responding to student contact—or proactive, taking the inititative to reach out to students. Such proactive support can also be referred to as *interventions*, and there is evidence for the retention effects of such interventions (see Table 1).

Table 1

Proactive Nonacademic Student Support and Subsequent Retention Effects

Study	Method	Retention	Notes
Case & Elliot (1997), US	Phone calls	15%–20% increase	2–5 calls effective
Visser (1990), UK	Postcards	27% increase	Small-scale study
Chyung (2001), US	Phone calls	Dropout reduced from 44% to 22%	
Simpson (2006), UK	Calling before starting	5.1% increase	640% RoI*
Twyford (2007), Australia	Motivating e-mails	11.7% increase	Significant at 0.5%
Huett (2008), US	Motivating e-mails	23.4% increase	

Note. Adapted from Supporting students for success in online and distance education, by O. Simpson, 2012, Routledge. Copyright 2012 by Routledge.
*RoI = return on investment.

While these studies are quite old, more recent studies confirm these early findings (e.g., Inkelaar & Simpson, 2015; Rotar, 2022). Most of these studies use proactive contact with an experimental group of students, comparing their retention with a control group. The type of contact varies—Simpson (2008) argued that the contact needs to be mainly motivational, but it appears that several different kinds of intervention can have some effect (Rotar, 2022). Some of these interventions have been costed and show a positive return on investment.

Cost–Benefits of Retention Activities Through Proactive Nonacademic Student Support in Online Education

I suggest that investing money in some forms of nonacademic proactive support can increase student retention while also having a positive cost–benefits result—that is, the institution will get more money back from the investment than it has spent. It can then invest more in further support with hopefully yet more positive retention results.

Of course, it should be noted that investing in purely academic support—that is, online teaching—whether via course materials or through online tutorials, will also increase student retention. Clearly, excellent teaching must increase student success. But the link between teaching and student success has been harder to measure and certainly much harder to cost. We must hope for researchers to tackle that problem, but until then, focusing on the costs and benefits of nonacademic support may at least help us understand this new investing approach to online learning.

However, one of the problems of developing such an understanding is the variety of funding systems used by different universities. This paper analyses a number of different financial scenarios to see if methods can be developed to work out the costs and benefits of retention activities. Unfortunately, very few reports of retention activities appear to be costed in any way. Nevertheless, it will be useful to proceed to an analysis of costs and benefits in the hope that future studies will record their costs as well as their outcomes.

Scenario 1: Externally Funded Institutions Where Funding Is Linked to Outcomes

Until recently, universities in the UK were granted state funding partly based on the number of students completing each year (i.e., sitting the end-of-year final exam). That is no longer the case, but the situation is covered here as it illustrates a simple method and because there are still some institutions that are partly funded this way—for example, the Open Polytechnic of New Zealand.

Take a course module with N students on it and apply a retention activity costing £P for each student, which increases student retention on a course module by n%.

Then the total cost of the activity is:

$$£NP \tag{1}$$

and the extra number of students retained is:

$$Nn/100 \tag{2}$$

So the cost per extra student retained is:

$$£[NP/(Nn/100)] = £100P/n \tag{3}$$

On the benefit side, if the government grant per student completing is G and the cost of recruitment per new student is M, then the extra institutional income per student from the increased retention is:

$$£(G + M) \tag{4}$$

in grant and recruitment cost savings since fewer new students will have to be recruited to replace the numbers dropping out. (Of course marketing overheads will remain, so the actual recruitment costs saved will be less than M. It is assumed that the actual savings are cM, where the factor c accounts for that proportion of overheads.)

Thus, the institutional profit per student out of the retention activity (if any) is:

$$G + cM - 100P/n \tag{5}$$

Example—Scenario 1. In a five-year project in the UKOU (Simpson, 2004), a phone call costing roughly £10 was made to individual students before they started their course modules. It was found that the contacted group had an average 5.1% increase in retention over a control group (this may seem a small increase, but it was significant not only statistically but in the context of the relatively short nature of the proactive intervention). Thus, the cost per student retained from Equation 1:

$$= £100P/n_p = 100 \times 10/5.1 = £196 \tag{6}$$

This may seem a high figure to pay for one student's retention, but it must be set against the then–UK government grant per retained student (G), which at the time was approximately £1,400, and the then–recruitment cost per student (M) of about £500 (this assumes that the factor c might be very roughly around 0.5 so that about half the marketing cost might be saved).

Then, the *institutional surplus per student* from Equation 2 becomes:

$$£(G + 0.5M - 100P/n)$$

$$= 1{,}400 + 0.5 \times 500 - 196$$

$$= £1{,}454 \quad (7)$$

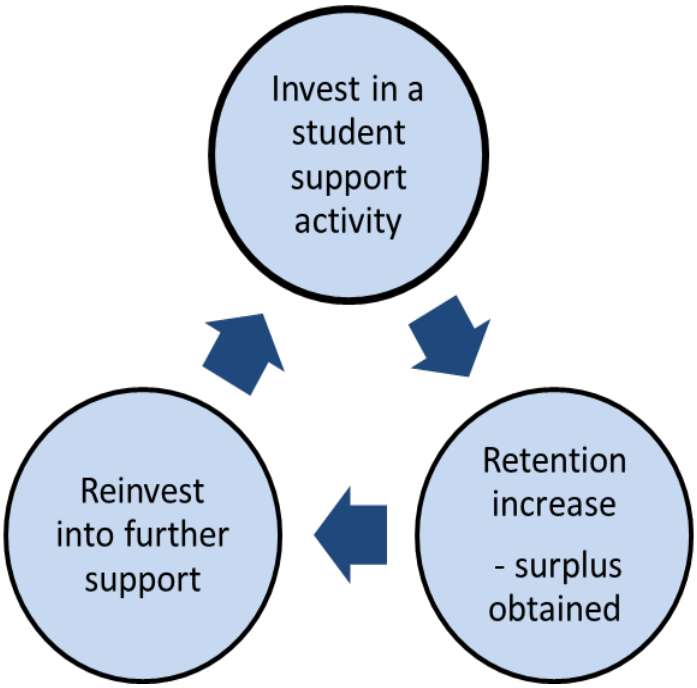
In 2004 the number of new students each year in the UKOU was around 30,000. So if the retention activity was applied to all those students, the *total institutional surplus* would have been:

$$30{,}000 \times £1{,}454 = £4{,}362{,}000 \quad (8)$$

—a not inconsiderable figure, even for an institution with an annual income of several hundred million pounds. It was also a figure that, if reinvested in student support in a kind of feedback triangle, would make a very considerable difference to future student retention (see Figure 2).

Figure 2

A Feedback Triangle—Reinvesting a Support Activity Surplus Back into Student Support



Contrast this feedback triangle with Daniel's "iron triangle" of access, quality, and cost (Daniel et al., 2009) in education, where it is impossible to change one side of the triangle without having a deleterious effect on the other sides: "Packing more students into bigger lecture halls may increase access but will lower quality, defined as faculty–student interaction, unless the cost is increased by hiring more teachers. Similarly, attempts to improve quality usually restrict access and raise costs" (p. 4).

The feedback triangle suggests a way of overcoming the rigidity of Daniel's iron triangle by showing that increasing quality of support can increase retention, which provides a surplus, which in turn can allow access to be increased.

Return on Investment. Another perspective on these figures is to treat the cost of the retention activity as an investment and calculate the return on that investment (RoI) from the surplus. That would be:

$$\text{(Gain from investment} - \text{cost of activity)} / \text{cost of the activity}$$

$$= (1{,}454 - 196)/196$$

$$= 640\% \quad (9)$$

This is a return that would be envied by most commercial companies.

Scenario 2: Institutions Funded by Fees from Students

Many institutions are funded through combinations of fees from students, such as registration fees, initial tuition fees, and exam fees. Such combinations can be complex. To understand how such combination might work, it is useful to take examples of different fees separately.

Example Scenario 2(i)—Exam Fees. The University of London International Programmes (UoLIP) charges a fee for students who wish to sit the end of module exam. In this case, an extra number of students completing will increase institutional income by the net exam fee £E, where £E is the difference between the fee paid by students and the cost to the institution of providing the exam per student (it is assumed that institution at least aims to cover this cost with the fee so that this net fee E is positive).

So again, if a retention activity costing P per student increases retention by n%, the extra institutional income generated by an increase of (n/100)N extra students completing the course and paying the exam fee will be:

$$(n/100)NE \quad (10)$$

So the overall extra income to UoLIP will be:

$$(n/100)NE \;\; NP \quad (11)$$

Assume a retention activity costing £2 per student produces a retention increase of 5% amongst 1,000 students on a course module whose exam fee is £200 (an approximate figure for UoLIP). If we also assume that the actual cost of providing worldwide face-to-face examinations is about £150 per student, then that leaves a net exam fee to UoLIP of £50. Then the overall extra income to UoLIP becomes:

$$£(5/100) \times 1{,}000 \times 200 - 2 \times 1{,}000 = £8{,}000 \quad (12)$$

This particular retention activity example would then run at a surplus of £8,000. In such a circumstance, the net exam fee might be increased to increase the surplus or reduced to encourage more students to sit the exam. Either way, the process should offer some insight into the costing processes within UoLIP.

Example Scenario 2(ii)—Tuition Fees. A more common scenario is the one where the institution is wholly or largely funded by student fees. This is a more complex situation, but a simple analysis is to look at the increased income from the increased number of students completing one module going onto the next module in the programme.

Thus, as in Scenario 1, assume that a retention activity costing £P per student is applied to all N students in a programme and causes an increase in retention of n%. Then, as before:

$$\text{Increase in students retained} = (n/100)N \tag{13}$$

$$\text{Total cost of the retention activity} = £NP \tag{14}$$

It can be hoped that there will be extra income because of the activity, due to the successful extra (n/100) × N students re-registering for the following year and paying a tuition fee of £F:

$$\text{Extra income in following year} = £(n/100)NF \tag{15}$$

Thus, the surplus income will be the difference between the extra income and the cost of the activity:

$$= £[(n/100)NF - NP] \tag{16}$$

So for the activity to be self-supporting or to generate a surplus, we need:

$$£[nF/100] \geq P \tag{17}$$

In the UoLIP, typically, the number of students on a module might be N = 1,000 and the student fee F = £800. Again, assume a retention activity cost of P = £10 per student. Then, for the retention activity to be self-supporting or generate a surplus:

$$n \times 800/100 \geq 10 \text{ or } n \geq (10/8)\%$$

$$\text{that is, } n \geq 1.25\% \tag{18}$$

So, in this example, as long as the increase in retention is equal to or greater than 1.25%, the activity will be self-supporting or generate a surplus.

If the percentage increase was as much as 5% with an activity cost of £2 per student as it was in the study by Inkelaar & Simpson (2015), then the institutional surplus income would be:

$$£[nF/100 - P]N = £[5 \times 800/100 - 2] \times 1{,}000$$

$$= £38{,}000 \tag{19}$$

—a much smaller amount than in Scenario 1 but still a useful sum to perhaps reinvest into the retention activity. And given that the initial investment into the retention activity was NP = 1,000 × 2 = £2,000, the RoI will be:

$$(30{,}000 - 2{,}000)/2{,}000 = 1{,}400\% \tag{20}$$

—a return better than Scenario 1 and still an enviable one by commercial standards.

Example Scenario 2(iii)—Maximum Expenditure on Retention Activities Value. Alternatively, if the institution set a specific increase in retention target, it is possible to calculate the maximum expenditure on a retention activity, which would still break even or generate a surplus. The possible surplus is:

$$£[nF/100 - P] \text{ per student} \tag{21}$$

Then as long as

$$P \leq nF/100 \tag{22}$$

the activity will break even or make a surplus. For example, if the retention target in the above example is 5%, then:

$$P \leq 5 \times 800/100 = £40 \quad (23)$$

The institution could then spend up to £40 per student on a retention activity and still break even or make a surplus—if the target were reached. Of course, this increase in income will occur in the year following the one in which the expenditure occurred, which increases the complication of assessing the actual profit and RoI, but the method still gives an estimate of the way in which both may be very roughly calculated.

UoLIP actually charges both a tuition fee and exam fee. In this example, the combination of the surplus from the increase in student fee from a 5% increase in retention of £38,000 and the surplus of £8,000 on exam fees means that the overall surplus is £46,000.

Scenario 3—Institutions That Charge Both a Tuition Fee and an Exam Fee, Taking into Account Institutional Overheads

Combining the first two scenarios of tuition fee and exam fee is of course a considerable simplification. A better analysis needs to take into account an institution's basic overheads. This situation is again considerably more complex than any of the previous ones.

Assume that in any programme there is a fixed institutional overhead £V per year plus a student-related expense of £S per student per year. Then, if the number of students on the programme is N, the total expenditure on the programme is:

$$= £(V + NS) \quad (24)$$

This of course is a huge oversimplification of the complex funding flows in an institution, but it is a useful starting point for analysis. If the annual student registration fee is F, then total institutional income per year is:

$$= £N(F) \quad (25)$$

Total surplus income (if any) will be:

$$= £[NF - (V + NS)] = £[N(F - S) - V] \quad (26)$$

The increase in income from n% extra students taking the exam and re-registering for the next module will be:

$$= £[(n/100)N(F + E - S - V/N) - NP] \quad (27)$$

Example Scenario 3—Tuition Fee and Exam Fee Combined with Overheads. If there is a 4% increase in retention at a cost of £5 per student on a programme with 1,000 students and the registration fee is £800, and the exam fee is £200, with a student-related expense of £200 and a fixed overhead of £5,000—n = 4%, P = £5, N = 1,000, F = £800, S = £200, and V = £50,000—then the extra total income due to the activity will be:

$$= £[(n/100)N(F + E - S - V/N) - NP] \quad (28)$$

$$= £[(4/100)1{,}000(800 + 200 - 200 - 50{,}000/1{,}000) - 1{,}000 \times 5]$$

$$= £25{,}000 = \text{increase in income due to increased retention} \quad (30)$$

Alternatively, given all the figures above except n, it can be worked out what n (the percentage increase in retention) has to be to make a surplus. That is,

$$£[n/100)N(F + E - S - V/N) - NP] \quad (31)$$

must be greater than zero. So:

$$(n/100)N(F + E - S - V/N) > NP \quad (32)$$

$$n(800 + 200 - 200 - 50{,}000/1{,}000) > 1{,}000 \times 5$$

$$n(750) > 5000 \quad (33)$$

$$\text{Therefore, } n > 6.7 \quad (34)$$

Thus the increase in retention must be greater than 6.7% to make the activity self-supporting.

Example Scenario 3—Graphical Representation. It may be easier to see what is happening in these equations if they are represented graphically. For any retention activity in this example to be self-supporting:

$$£[(n/100)N(F + E - S - V/N) - NP] > 0 \text{ as before} \quad 35)$$

$$(n/100)(F + E - S - V/N) > P \quad (36)$$

Inserting the assumed figures as before with the exception of n and P, which we now treat as variables, we get:

$$(n/100)(800 + 200 - 200 - 50{,}000/1{,}000) > P \quad (37)$$

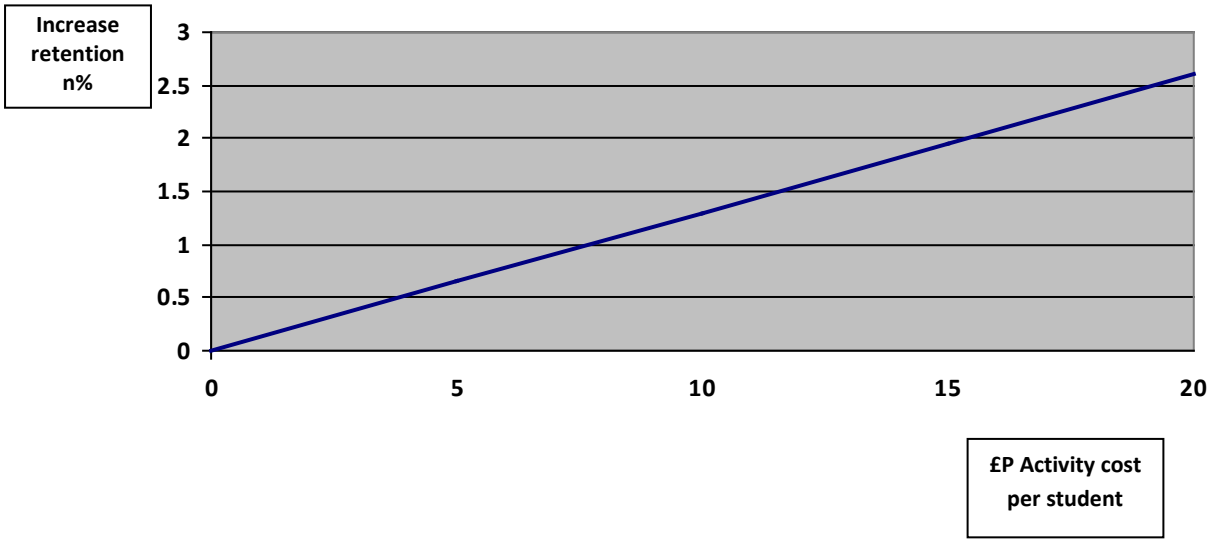
which simplifies to

$$n > 0.13P \quad (38)$$

In other words, in this case, if the percent increase in retention n is greater than 0.13 times the cost per student of the retention activity P, the institutional income from the activity (the return) will be greater than the cost of the activity. Thus, the activity will make a surplus for the institution. If n is less than 0.13P, then the activity will create a loss. Plotting the graph of n = 0.13P, we get Figure 3:

Figure 3

Graph of £P—Retention Activity: Cost per Student Versus n%—Increase in Retention



Any activity costing P whose n% falls above the line will be self-supporting or make a positive return. The higher the point above the line, the greater the return will be. For instance, a retention activity that costs £10 per student, which then results in an increase in retention of 2%, will fall above the line and therefore will make a net surplus for the institution. An activity costing £10 per student but that only gains an increase in retention of 0.5% will fall below the line and so will run at a net loss to the institution. An activity costing £10 per student, which results in a retention increase of 1.3%, will fall exactly on the line and will make neither a surplus nor a loss but will at least be self-supporting.

Obviously, these figures will depend entirely on the actual values of F, S, V, and N at any time and the assumption that the increase in the number of students completing one module will transfer to registration on the next.

Discussion and Conclusions

This study suggests that it is vital that higher educational institutions pay detailed attention to how they invest their money. This is particularly important for online institutions, which appear to suffer online education deficits, with markedly lower graduation or completion rates compared with conventional education institutions. Such deficits could even threaten their existence. However, the study suggests that investing money in certain kinds of carefully designed proactive nonacademic student support can both reduce deficits as well as produce financial surpluses, which can then be reinvested in further support.

This study may be challenged in many ways, and not just in its assumptions, approximations, and simplifications. One particular limitation, for example, is that the formulae apply only in specific circumstances where well-costed specific support activities lead to statistically clear retention outcomes in random controlled trials. Such trials are still rare in the research literature.

A further limitation is that this study says nothing about the basic splits in institutional funding between nonacademic support, academic support (supplemental teaching), and the amortised cost of online course production and presentation. Many online educators might argue that course production is the more important element in online learning, since it seems likely that no amount of academic or nonacademic support could overcome the adverse outcome of a retention-hostile course. Equally, it is difficult to assess the level of appropriate funding for supplemental teaching to increase retention. As Bozarth (2011) notes, "Much learning takes place without teaching, and indeed much teaching takes place without learning" (para. 8).

In addition, teaching and course writing may sometimes be seen as more desirable activities for academics than the daily effort of nonacademic student support and, therefore, may attract more resources. Indeed, in some institutions, student support may well be delegated to part-time or temporary staff. And student support will usually be at the front of the line for inevitable cuts when institutions are required to retrench (Hulsmann, 2004).

These and other limitations aside, there appears to be one salient fact: everything online educators do to increase the success of their students is ultimately a function of the resources available to them—that is, the money they have access to. Without an attempt to see how that money is most effectively applied to the problem of student retention, institutions will continue to struggle to overcome their online education deficit problems.

The late Sir Eric Ashby might still wonder if online institutions are working more on hunches than anything else. But online institutions are full of highly intelligent analysts, statisticians, accountants, and academics. There is also the potential game changer of artifical intelligence to be applied to student support. This article argues that it is high time the talents of such staff be applied to the complex challenges of discussing and evaluating the role of money in online educational student support.

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What It Is and Is Not: Pedagogy in Online Nursing Education Delivery

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Abstract

Nursing has employed distance education for decades. In the 21st century, distance programs have often been delivered online. This became even more prevalent since the COVID-19 pandemic. Despite the preponderance of online nursing courses, the delivery of courses virtually does not necessarily mean that these offerings are intentionally developed online education. We discuss a secondary analysis of data examining the formation of online nursing programs at Athabasca University. This historical inquiry used interpretive description of the pedagogy, both learning strategies and the theories that substantiate the strategies, using thematic analysis. Participants discussed their theoretical substantiation of online education. We posit that online nursing education involves a purposeful pedagogy including theoretical bases and would benefit from a strong sense of mission behind the course delivery. Findings from this study may apply to online programs, irrespective of profession or discipline.

Keywords: nursing education, online delivery, pedagogy, post-licensure programs

What It Is and Is Not: Pedagogy in Online Nursing Education Delivery

Distance education (DE) in nursing has been delivered for decades (Billings, 2007). Online learning through the Internet has become a common way of delivering education, particularly since the World Health Organization (WHO) declared COVID-19 a pandemic in March 2020 (WHO, 2022). At that time, post-secondary institutions needed to quickly pivot to the online delivery of previously face-to-face courses and programs. With the presence of online learning in nursing, it is not surprising that there are many studies examining how online delivery has been offered, both within the context of non-pandemic living (e.g., Johnson, 2008; Legg et al., 2009; Peck et al., 2021), and within the COVID-19 pandemic (Howe et al., 2021; Hu et al., 2022; Manakatt et al., 2021; Oducado & Soriano, 2021; Vuttanon et al., 2021). We posit that within nursing literature, educational strategies may be presented about online delivery, but there is still misunderstanding regarding what deliberate or planned online education is and is not.

Further, there is often a lack of depth in understanding and describing the associated pedagogy. Pedagogy has been defined as "the theory of teaching . . . [and] involves the complex relationship between philosophical concepts and practical actions" (Wang & Huang, 2018, p. 261). Although the term pedagogy originally referred to principles in teaching children, and andragogy the education of adults (Knowles, 1984), within dictionary definitions (e.g., Online Oxford Dictionary, Cambridge Online Dictionary) the term pedagogy is commonly used in describing teaching/learning strategies irrespective of age. As such, we will use pedagogy. Within nursing literature about online delivery, the use of theory to substantiate practical actions is often missing or lacking a fulsome description.

It may be useful also, to define the terms distance, online, virtual, and remote learning. Distance education encompasses different forms of teaching, such as courses delivered online (Ryan et al., 2004). However, distance education is larger, as it is a system of teaching and learning rather than the focus on technology (Ives & Walsh, 2021). Remote learning involves moving face-to-face learning temporarily online (TeachThought, 2022). Virtual learning, such as an online course, is delivered via computer; however, according to Winstead (2022), virtual learning may be more interactive than courses delivered online.

This article describes a secondary look at data within our study, which examined the formation of online nursing programs at Athabasca University, a large international open and online university based in Athabasca, Alberta, Canada. We first describe how online delivery of nursing education is addressed in the literature. Then, we briefly outline our ongoing study examining the formation of online nursing programs for Licensed Practical Nurses (LPN), to Baccalaureate-prepared Nurses (BN) and Registered Nurses (RNs), to degreed nurses. This brief description is intended to give a background to the secondary analysis of our interviews pertaining to mission and pedagogy that underscores online education. Within the discussion, we distinguish between online course delivery and online nursing education. We hypothesize the importance of strong pedagogy and mission to substantiate online education. Findings from this study may be applicable beyond nursing to online programs from other professions or disciplines.

Literature Review

How Online Nursing Education is Addressed Within the Literature

The literature includes a preponderance of articles/studies that have addressed the benefits of and barriers to online delivery of content. Benefits to online nursing course delivery included accessibility, flexibility, and control (Baruth et al., 2021; Bramer, 2020; Peck et al., 2021; Plowman et al., 2017) for students and instructors. Also, students did not lose time through commuting to institutions (Talbert, 2009). These benefits were particularly salient for adult students who were working and had families (Hart & Morgan, 2010; Plowman et al., 2017), or who lived in rural locales far from educational institutions (Riley & Schmidt, 2016). Barriers included challenges related to technology/Internet use (Baruth et al., 2021; Buckley, 2003; Johnson, 2008; Nikpeyma et al., 2021; Ryan et al., 2005; Uprichard, 2020) for both students and instructors. Students who had difficulty with motivation or organization may have also struggled if the course delivery was asynchronous (e.g., Bramer, 2020; Iheduru-Anderson, 2021). Instructors who loved lecturing and face-to-face teaching may have struggled moving from didactic teaching to the facilitator role (e.g., Johnson, 2008; Sword, 2012).

Many authors described online learning within the contexts of single course delivery (e.g., Manakatt et al., 2021; Shuster et al., 2003), graduate online education (e.g., Harlan et al., 2021; Tiedt et al., 2021), or continuing education for working nurses (Nadeau et al., 2020; Riley & Schmidt, 2016). A number of recent studies addressed the move to online learning because of the COVID-19 pandemic (e.g., Bowser et al., 2022; Manakatt et al., 2021; Oducado & Soriano, 2021; Vuttanon et al., 2022). Further, while some authors discussed pedagogical considerations—in terms of strategies for teaching online—the theoretical substantiation and framework that has guided the formation of what and how teaching and learning were experienced, was most often missing. Notable exceptions include the work of Camacho et al. (2016) who focused on the role of tutors as pedagogical mediators who continually reflected upon knowledge construction with the learners. This coincides well with the discussion of Legg et al. (2009) and Edwards et al. (2011) regarding constructivist strategies. Edwards and colleagues (2011) also discussed the community of inquiry model (Garrison et al., 2001) for guiding the development of online education. One study examined the community of inquiry model in guiding the use of asynchronous discussion boards and was an interprofessional study with nursing as one of the eight professionals involved (Evans et al., 2020). A more fulsome discussion of theories involved in pedagogical strategies will follow in the forthcoming discussion section.

Brief Overview of Common Frameworks for Organizing Online Content

Common frameworks used to address content delivery have included the community of inquiry (Garrison et al., 2000), and constructivist approaches. The community of inquiry model included three major components: social presence, cognitive presence, and teaching presence. The educational experience is situated in the area where the three components (represented by circles) overlapped (Garrison et al., 2000). When education is delivered online, social presence (where students feel connected to peers and the instructor) and teaching presence (as demonstrated in the design of the course), and facilitation of social and cognitive processes results in meaningful learning (Anderson et al., 2001).

Constructivist theories have focused on building upon the pre-existing knowledge that students bring to a course (Melrose et al., 2013). This occurs through meaningful learning activities, and the instructor getting to know students in order to understand how they interpret and learn knowledge. Constructing meaning is part of knowledge acquisition (Melrose et al., 2013).

Research Method

Background

The overarching purpose of this qualitative study guided by historical inquiry was to capture how online nursing education has been conceived and developed in Canada, with Athabasca University programs being the primary focus. The undergraduate programs (i.e., RN to BN, and LPN to BN) offered through Athabasca University constitute some of the first online undergraduate programs in Canada and North America, incorporating theory around distance education with delivery provided by the Internet. Conceptualized in the early 1990s by an innovative group of nursing educators, the BN bridging programs have grown to become some of the largest programs in Canada and internationally. It should be noted that the undergraduate program that provides BN education to LPNs also involves face-to-face clinical, with the bulk of the education program delivered online.

Ethics and Data Collection

Ethical approval was received from Athabasca University for the primary data collection (No. 24332). Semi-structured interviews (see Table 1) were conducted with 17 participants selected through purposive sampling. Data collection occurred between September 2021 to September 2022 and was carried out through online interviews (MSTeams or Zoom) or via phone, with follow-up e-mail for clarification or explanatory purposes (with permission from participants). Participants included nine current or former faculty members (nursing), three former/current non-nursing faculty at Athabasca University, one nursing tutor, two administrators (one current and one former), and two instructional design experts within the Faculty of Health Disciplines (including nursing) at Athabasca University.

Table 1

Semi-Structured Questions for Interviews

Question number	Question content
a.	Can you tell me about your relationship with Athabasca University? Can you give me a background for yourself and how you came into nursing and Athabasca University?
b.	What is your understanding about the early days of nursing education in Canada? How did the internet (World Wide Web) come to be viewed as a possible means of education for nurses?
c.	What was your role in the nursing education programs developed at Athabasca University? Can you talk about the development of these specific programs?
d.	Who were key players in bringing nursing education online at Athabasca University? Did they come from other institutions and how were these conversations started?
e.	What were important barriers to developing online nursing education? What did people say? Was there pushback from the education community? University? Nursing profession?
f.	How did your roles in the development of virtual nursing education change? Why? What factors were in play in these early years?
g.	What pedagogy/philosophy underpins your online teaching?
h.	Are there other key players we should talk to? Can you provide their name and contact information?
i.	Where are resources (i.e., hard copies) of early documents located? In personal collections? In the Athabasca University library? Where might we search for more information?
j.	What else should we know about the history of virtual nursing education?

Each of the interviewed participants addressed their involvement in the conceptualization and implementation of the undergraduate online programs. In some of these interviews or follow-ups, individuals spoke about pedagogical/philosophical underpinnings that substantiate the strategies used in course and program development. The data collected represents how participants understand pedagogy and theories that underpin the participants' pedagogy for online nursing education.

Participants were invited to be interviewed if they had been involved in the conceptualization of the online nursing programs or if they participated in the implementation of these programs. Fourteen of the participants identified as women and three as men. Almost all of the participants held graduate degrees (Master or PhD); 14 had taught or were teaching when the online nursing programs were conceptualized or rolled out. At the time data was collected, six participants were retired.

Data Analysis

Data analysis occurred through line-by-line reading and re-reading transcripts by both members of the research team. We asked: what is the pedagogy that informs your online teaching? Interpretive description, as the framework for this historical inquiry, allows for additional questions to be posed based on the expertise of the interviewee and the specific information gaps or knowledge the researchers are attempting to acquire (Thorne, 2016). Themes regarding the pedagogy of online education, in particular, those related to the theoretical underpinnings, were considered and discussed. If there were questions about the accuracy of interpretation, the first author contacted the participant and clarified the discrepancy to protect the trustworthiness of the findings (Woo, 2019).

Findings

The findings of this secondary analysis of data included the following themes: (a) what constitutes and does not constitute online learning, (b) the importance of the mission, and (c) the pedagogies to underpin online education.

What Does and Does Not Constitute Online Learning?

Participants spoke about what is online learning, and what it is not. Misconceptions about online delivery includes what constitutes online education. It does not mean that students receive the same lectures they would within a university classroom, but instead, learn the prescribed material online. "You know, you're not doing online education, you're doing remote delivery. So, there's a difference. They're still trying to do their three-hour lecture online. So that's remote delivery. That's very different from specifically designed online learning" (Participant 6).

> Because a lot of teachers (are) saying . . . that online learning is face-to-face through a machine, it's rotating classroom on the machine, but that's not online learning. . . . And basically, it's how to use Zoom. You know, it's not online learning in all its complexity, it's really sad. (Participant 8)

Both participants (6, 8) noted that learning online is different from lecturing online and one described that approach as remote delivery. One participant also spoke about misconceptions about the value of online teaching.

> Now, there was always that sort of ho hum, online learning is not as good as face-to-face learning. You know, for years that was in the background. Yeah. But we all knew was better. We all knew was better. So yeah, was better for the students. The students loved it as much as we did. (Participant 11)

How does online education actually differ from online delivery of information? Designing online education, according to the participants, involved greater complexity and multiple interactions/relationships.

> So we were the first people to talk about, you know, the course needs to connect students with a teacher with each other and with the material. So, the community of inquiry model was out. Yeah,

> when we started the Master of Health Studies. So, we looked a lot to that. Terry Anderson . . . was one of the original authors of the community of inquiry model. . . . And we incorporated that in all of our course design. (Participant 6)

> Interaction that is a normal and required part of distance education at the university level, in the way we define it requires interaction and interactivity. Interaction with other people and interactivity with content and activities and so on. . . . So, taking the content from a study guide and transforming it digitally so that it fits into a learning management system but not allowing for group work or communication or discussions whatever, is not really online. (Participant 15)

> Delivering online education, particularly when the Internet was new, involved designing the courses according to the technology that students had. So we really, if we're going to use video, we had to make sure it was very small and very tightly compressed, which meant that it was kind of grainy and postage stamp sized. It meant that the technology was still going to catch up to us—had to catch up to us for a while—before we get started to do you know more of the multimedia. (Participant 7)

The Importance of Mission

Participants spoke about the mission of Athabasca University—to deliver education to students who otherwise might not be able to attend university due to barriers such as access issues (living in rural areas) or working full-time with children. They noted that there was excitement when the decision was made to go online (Participants 1, 4) and that this was "innovative" (Participant 10) and "pivotal" (Participant 5). Online education would further facilitate the mission of Athabasca University, to provide education to individuals who might not otherwise be able to pursue further education (Participant 12). This mission was embedded in the speech and enthusiasm of participants. One participant, when speaking about this mission stated, "but I was so proud of being a member of Athabasca University because I was absolutely convinced completely and never questioned, that we weren't doing something critical. Something that gave people the opportunity to pursue additional education" (Participant 2). Another participant spoke about how this mission had the potential to change the lives of individuals with disabilities. She noted how she has taught students with extreme disabilities. In speaking of one student who is quadriplegic and completed a master's degree, she said, "And he is in a nursing home . . . he works with voice recognition technology and had (a) mouse, and is a great student, you know, he was inspirational. He worked really hard" (Participant 13). This mission also brings meaning and purpose to educators. As one participant noted,

> And I thought, yeah, that it really, gives me purpose and meaning in my work. . . . So but I think that mission always, was there in our minds, as we're thinking about new ways of offering the courses, new ways of, you know, revising the courses to make them more accessible to everybody and more meaningful to all of our students. (Participant 5)

Interestingly, the move to online nursing education should not occur just because the technology facilitates this (Participants 5, 6, 10). The emphasis should always be focused on the beneficial impact upon students. "I hope you're not, you're not moving with the technology for technology's sake. You're moving with the technology for the client's sake. Like you should be. Right" (Participant 10).

> And I think one of my ongoing messages is that there's no right way and a wrong way. But what we're looking at here is an option for people who need this option or like this option. So this option is not for everybody. And there are people who should not do online learning. (Participant 6)

For instance, online education can not only help those who are disabled, it can reveal disabilities in students that were previously not as obvious.

> But there were people who didn't appear disabled . . . people who are what we call print disabled. People who weren't good readers, or who were dyslexic. A lot of hidden disabilities became visible disabilities in an online environment. (Participant 13)

Also, some educators may not understand the pedagogy behind online education. As one participant noted,

> While a lot of distance educators are practitioners, they may not be academics; They may not be grounded in the theory and practice of distance education which really goes back to the 70s. And some of the early thinkers about distance education are not understood or known by current practitioners of online education. (Participant 15)

As noted by this participant, educators may largely be practitioners, and not have a strong background in online education. Even if educators have some experience with and knowledge of online education, they may not know how online pedagogy developed or what it addresses.

Pedagogies That Underpin Online Education

According to participants, the presence of pedagogy in the construction of online courses, as well as the knowledge and skill of educators in practicing this pedagogy with their students, is crucial (Participants 5, 6, 7, 8, 10, 15, 16, 17). The community of inquiry model was mentioned by several participants as their underlying pedagogy (6, 15, 16). This model, introduced in 2001 (Garrison et al.) substantiated the focus and strategies to foster connectivity with students and the instructor, students with each other, and students with the content. As noted by the participant below, the educator facilitates contact with the students and attempts to promote their engagement with course material.

> So I firmly believe that interaction which is the basis of the community of inquiry. . . . As a facilitator of online learning, one of my roles is to encourage their engagement of the course materials . . . through a phone call . . . you need to be present with the student so it facilitates their engagement with the online environment. (Participant 16)

Others spoke about constructivism (Participants 15, 16, 17), andragogy (Knowles, 1984), invitational theory (Participant 5), or nurse educator Virginia Henderson (Participant 2) as influencing their pedagogy for online education. The participants were thoughtful and purposeful in how they described the pedagogy that supports their online teaching. For instance, Participant 5 discussed the tenets of invitational theory (IT) and how these impacted how she engaged in online teaching.

> I think that IT applies to all teaching and learning situations, but it is especially important online. The five tenets of IT are trust, respect, intentionality, optimism, and care. As I teach and design online courses, I try to be very deliberate using strategies and interactions that support these tenets.

This participant also shared how these tenets are enacted in her relationship with students, but also, how it is difficult to develop relationships in online education.

> For example, how do I establish mutual trust and respect—it begins by spending time in getting to know learners and inviting them to know me. This foundation is so important to learning and it can be a little more challenging online if you do have those more informal interactions that allow the personality (and evidence that you care) shine through. (Participant 5)

Importantly, theories that underpin online education pedagogy should be congruent with life philosophies held by educators (Participants 5, 17). "Obviously if philosophy is our worldview . . . then philosophy will influence our pedagogy and we're quite likely going to pick strategies approaches and methods and ways of doing things that fit with the way of looking at the world" (Participant 17). "I think your philosophy (values, etc.) is your blueprint for all your actions and interactions in life. Your teaching philosophy has to align with your personal philosophy so you can become real to online learners" (Participant 5).

Both of these online educators acknowledged the importance of our world views/philosophies being in alignment with the strategies/theories (pedagogy) on online teaching. Participant 5 noted that if an educator's overall philosophies of life are not congruent with their online pedagogy, they will not be authentic.

Discussion

Within nursing literature, online course delivery appears to have been considered as online education. As noted by the participants, remote delivery is not online education. Online education involves understanding and utilizing purpose-specific pedagogy. As noted by Brown (2019), the term pedagogy is a messy term that has many interpretations, some focused on the practices of education, and others on the theories that drive that practice. However, educators often focused on strategies or practices, without an understanding of the theories that substantiate these practices (Brown, 2019). Educators should be aware of the theories that undergird their practice and apply them intentionally, otherwise they may replicate the same modes of teaching that they received as students (Brown, 2019). Also, they need to understand their own theoretical/philosophical background, otherwise they will not be effective with their students (Wang & Kania-Gosche, 2011). Further, good course design cannot seamlessly create strong theory-based practice in educators. As noted by Howe et al. (2021), even when there is deliberate course planning by developers that includes a theoretical basis for the activities, nurse educators may not recognize this, and the nuances of effective online delivery may be missed.

Interesting, a couple of nurse educators mentioned that they used nursing theory to guide their work. One noted drawing upon the work of nurse theorist Virginia Henderson (Participant 2). Another (Participant 5)

spoke about how caring (as a fundamental aspect of nursing) can be communicated through online teaching, although this can be more challenging. Within the undergraduate nursing programs at Athabasca University, one theorist is not preferred over another. This may be why educators did not refer to a specific nurse theorist as having influenced their nursing online education.

Within nursing literature, there is limited evidence of the theoretical underpinnings (as part of pedagogy) of online education. At times, constructivism has been noted, such as when Camacho et al. (2016) took this approach to describe the role of educators being pedagogical mediators. As pedagogical mediators, educators need to reflect on their role of meditating knowledge with students through communication and interaction with resources (Camacho et al., 2016). When others have used constructivism, this was in relation to the course content (cultural competence), rather than online education (Hunter & Krantz, 2010), or, was briefly mentioned as part of the pedagogy, but a fulsome discussion was not offered (Georgsson, 2019; Matlakala et al., 2019; Smith & Kennedy, 2020). The community of inquiry model (Smadi et al., 2021) or andragogy (Smith & Kennedy, 2020) have also been mentioned. Caring as a nursing pedagogy was applied to online education in response to COVID-19 in one study (Christopher et al., 2020). While others use the term pedagogy (e.g., Ryan et al., 2004), the theories or tenets that underline the strategies are missing, even when aspects, such as social presence (e.g., Cobb, 2011) are part of the theoretical tenets. Online educators, irrespective of profession, must be clear about the pedagogy that guides their practice; if they do understand the theoretical foundation for their strategies in online education, they are encouraged to share their understanding and application through publication.

If post-secondary institutions are delivering a post-licensure degree in nursing (post LPN to BN or RN to BN or graduate nursing programs), it may be useful to adopt a mission statement or strong guiding statements for the program(s). Our rationale is this: participants spoke with enthusiasm about how the mission of Athabasca University "dedicated to the removal of barriers that restrict access to and success in university-level study and to increasing equality of educational opportunities for adult learners worldwide" (Athabasca University, 2023, "Our mission" section, para. 1) gave them purpose and meaning in their work. Working with students in the online, virtual environment was not viewed as second best, but rather, significant, and life-changing for students.

Online education may have been seen as less effective than face-to-face; however, the evidence gathered from the educators interviewed in this study suggest otherwise. Online education may be more impactful and may result in deeper levels of thinking in the students than face-to-face. This is because students provide written rather than verbal responses; as such, they need to think about how they will present their ideas and what they really want to communicate (Esani, 2010; Porter et al., 2020). Other research has determined that there is no significant difference in learning for online students as compared to face-to-face learners (Abuatiq et al., 2017; Zucker & Asselin, 2003).

Recommendations

Although nursing education has been delivered across distances for many years, the pedagogy has not kept up with the delivery. Throughout the literature, theoretical frameworks are lacking (Aydemir et al., 2015). This is not just nursing; it may also be the predicament found in other professions and disciplines. As mentioned in the discussion, educators need to be able to verbalize the theoretical rationale for how they

conduct online education. Why is this so important? We posit several reasons. First, educators who can discuss the theoretical elements of pedagogy may be more intentional about how they teach online. Strategies to promote an atmosphere of community amongst the students, educator, and resources—grounded in theory—may invite educators to spend the time and effort in creating a welcoming and facilitative environment (Shovein et al., 2005). Second, educators should be able to address the theoretical rationale for their actions, not just in clinical practice, but also in education (Wang & Kania-Gosche, 2011). Third, if educational institutions are moving towards more blended course delivery than in the past (pre-COVID-19), greater emphasis on online education should include a solid pedagogical foundation and a mission statement that encompasses this form of delivery. This will be particularly important for programs that are largely online, for example, RN to BN programs. As noted in this study, a mission statement that includes providing education to students who might not otherwise receive university education (or something comparable) is extremely motivating for educators and bolsters the perceived importance of this modality of education.

As the literature has attested, instructional design experts are extremely important, not just for technological issues with online courses (e.g., Ives & Walsh, 2021; Jones & Wolf, 2010; Richter & Schuessler, 2019; Ryan et al., 2005), but also, to build in course design and activities that reflect the educators' theoretical foundation. They should be present in the planning of courses and discussions about curriculum design. Further, programs that increasingly use online courses would benefit from collaboration with distance/online specific educators about how to deliver online education that is impactful for their learners.

Clarity in terms regarding what is distance learning/education, online learning/education, e-learning, and virtual learning would be helpful. While they may be assumed to be similar, as we have elucidated in this article, this is not necessarily the case.

Conclusion

Online course delivery is an important part of nursing education. However, remote or virtual course delivery does not ensure that this is true, purpose-built online education. Pedagogy—particularly the theoretical basis—is often missing from discussions about online delivery in nursing literature. We suggest that this is a significant omission that not only impacts educators, but also students, regardless of the profession or discipline. As online education is becoming more common, explicating pedagogy and the theory that underlies this delivery mode is crucial.

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SCOPE of Open Education: A New Framework for Research

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Abstract

The field of open education and research on the topic has notably expanded since the introduction of the term 20 years ago. Given these developments, a framework to structure research inquiry is necessary to ground and organize findings in open education. We propose the SCOPE framework for open education research: social justice, cost, outcomes, perceptions, and engagement. In this article, we explain how this framework emphasizes the need for social justice at the forefront of open education research. In addition, we incorporate existing theories in social justice, motivation, cognition, pedagogy, and engagement into each of the components to propose theoretical connections to future open education research. We suggest areas in which future research is needed. Finally, we conclude with suggestions as to how the SCOPE framework may be useful when connecting open education to open science and open scholarship as well as a call for considering intersectionality and critical methods in quantitative research (QuantCrit) in future inquiry.

Keywords: engagement, open education, motivation, research framework, social justice

Introduction

Open education is the term used for developing and using resources, materials, and pedagogies which are freely accessible and shareable with others through open and flexible licensing. After the term open educational resources (OER) was coined in 2002 to describe openly licensed teaching and learning materials, research to examine the efficacy of these resources followed (Bliss & Smith, 2017). This burgeoning field of inquiry prompted the need for a framework to provide organization and cohesion to the research findings. The COUP framework, consisting of cost, outcomes, use, and perceptions of OER, addressed that need (Bliss et al., 2013). It is an important contribution to the field, but the concepts of inclusion and innate human right to knowledge essential to the open education movement (Biswas-Diener & Jhangiani, 2017; Deimann & Farrow, 2013) are not explicitly emphasized in the COUP research framework.

Open education research has shifted from primarily focusing on OER adoption to examining the novel teaching and learning techniques afforded by open licensing (open pedagogy; DeRosa & Robinson, 2017), which could affect student engagement. Open pedagogy, also known as OER-enabled pedagogy (Wiley & Hilton, 2018) and open educational practices (Tietjen & Asino, 2021), provides opportunities for students to "add value to the world" (Van Allen & Katz, 2019, p. 312). This value is added by creating, editing, revising, and sharing their work under a Creative Commons license (e.g., photographs, videos, websites, Wikipedia articles; Van Allen & Katz, 2019). This is based on constructivist pedagogy, which is "based on the idea that knowledge is constructed during experience, such as real-world problem solving, and by reflecting on those experiences" (Santos, 2018, p. 173).

Because of these advancements in the open education field, we propose the development and expansion of the COUP framework: the SCOPE framework (see Table 1). The SCOPE framework comprises social justice, cost, outcomes, perspectives, and engagement. In this discussion, we describe each component of the SCOPE framework and how it may be used to develop future research questions and purposes. We begin with background on the COUP framework.

Table 1

SCOPE Framework Concepts, Definitions, and Examples

Concept	Definition	Examples of areas of inquiry
Social justice	A corrective and liberatory practice that acknowledges the history of systems of oppression along with its modern day legacies. This is explicitly addressed through the equitable distribution of resources, opportunities, and attainment of full social, political, economic, and human rights for all.	Inequities of open education infrastructure and funding across institutions and regions globally Liberatory OERs and OEPs Centering perspectives that have been marginalized by social and political systems as well as institutions
Cost	Losses assumed to be either due to or avoided by open education.	Financial expenses and savings Course withdrawal rates Emotional cost Time Cognitive load Social and political costs
Outcomes	Presumed effects due to open education.	Grades Course enrollment intensity K-12 achievement Teaching practices Faculty retention, promotion, and tenure
Perceptions	Impressions and opinions of open education.	Quality measures by students and faculty Evaluations of faculty who use open education
Engagement	Fully participating and being actively involved in open education	Learning analytics Emotions that relate to learning Learning strategies

COUP Framework

In 2013, the COUP framework was proposed to organize research on the efficacy of adopting open educational resources in the contexts of costs, outcomes, use, and perceptions (Bliss et al., 2013). This framework has been a useful tool for grounding inquiry into OER for many empirical studies (e.g., Nusbaum & Cuttler, 2020; Tlili et al., 2022) as well as reviews of research findings (e.g., Clinton, 2019; Hilton, 2016, 2020). The researchers who developed the COUP framework provided helpful suggestions for methods of inquiry for testing the impact of OER adoption (Open Education Group, 2023). For example, cost includes financial expenses with textbooks and other course materials, tuition revenue due to changes in enrollment patterns, and student enrollment intensity (number of credits per term; Open Education Group, 2023). In this way, the COUP framework has been particularly useful in assessing differences between using traditionally copyrighted materials compared to open educational resources. However, one of the authors of the COUP framework and member of the Open Education Group has provided valid critique of open education research stating that "a stronger theoretical framework, including a hypothesized explanatory mechanism, is required for comparative research to provide useful insights" (Wiley, 2021, p. 412). In other words, in order to understand and facilitate the potential for open education to foster learning, we, as a field, need theoretically-grounded inquiry into why and how open educational resources (and open education in general) relate to learning (Wiley, 2021). The SCOPE framework is intended to expand upon the COUP framework to include theoretical frameworks for open education research. In addition, we explicitly update the COUP framework to include the dimensions of social justice and engagement.

Social Justice

The SCOPE framework leads off with social justice because commitment to inclusion and equity is fundamental to the ethos of open education (Bali et al., 2020; Croft & Brown, 2020; Lambert, 2018) and education in general (Ladson-Billings, 2014). Education equity is impossible without the centering of justice. Social justice is "… an ideal condition in which all members of a society have the same rights, protections, opportunities, obligations, and social benefits. Implicit in this concept is the notion that historical inequalities should be acknowledged and remedied through specific measures" (Barker, 2003, p. 405). As the field of open education continues to expand and identify more benefits of OER beyond cost savings to include practices and pedagogies that attempt to decolonize the curriculum, it's important to acknowledge the scholarship of several educational theorists who worked to break down barriers of white supremacist educational systems. An emancipatory approach to education, heavily represented in the works of Paulo Freire, bell hooks, Ira Shore, Henry Giroux, and Peter McLaren, focuses on the idea that a just and democratic society relies on the reimagining or negotiating of the curriculum and a negotiated curriculum allows students to assume more significant and shared responsibility in the classroom (Nouri & Sajjadi, 2014)—a concept that open education has more recently built upon with respect to open pedagogy. For example, Black feminist scholar bell hooks challenged educators to confront and transgress traditional boundaries of power and authority so that classrooms can truly become democratic spaces that support all students in the daily work towards freedom (hooks, 2003). This demonstrates how both open pedagogy and Black feminist pedagogy seek to challenge the role of both educators and students as well the utility of assignments (Roberts-Crews, 2022). As Omolade (1993) argued, Black feminist pedagogy advises educators to be more like guides or "consultants" in the education process, rather than controllers. Open pedagogy stems from the same impulse. Seiferle-Valencia (2020) argued how current efforts to create a more socially

just open education is not entirely new and reflects a Black feminist pedagogy, among many other critical pedagogies. Black feminist pedagogical rhetoric is not only relevant to open education, but essential to conversations about open values, practices, and pedagogy.

Social justice principles particularly relevant to open education include redistributive, recognitive, and representational justice (Lambert, 2018). Redistributive justice is ensuring access to resources to those who would typically encounter barriers (Rawls, 1971). With redistributive justice, OER removes financial barriers to learning materials. Recognitive justice is "recognition and respect for cultural and gender differences" (Lambert 2018, p. 227; see also Fraser, 1995). When faculty are designing and editing OER, recognitive justice is a critical consideration—is the content diverse, and are students able to see themselves in the materials? Representational justice involves hearing the voices and experiences of groups whose identities have been historically underserved in society (Fraser, 1995; Lambert, 2018). In open education, representational justice may manifest by actively inviting (but not requiring) all students to contribute their own voices to assignments that are then openly licensed and shared beyond the confines of the classroom. Indeed, students reported more opportunities for representational justice with open pedagogy assignments compared to traditional assignments (Clinton-Lisell & Gwozdz, 2023). Many commercial and OER textbooks still have limited coverage and representation of historically marginalized groups (Apple & Christian-Smith, 2017; Brandle, 2020), and both recognitive and representational justice can be leveraged to provide students with more diverse and representative learning materials.

It's important to note the application of these social justice principles will vary widely depending on the educational and structural context. This is particularly critical to consider as there remains an overrepresentation of the Global North in academic knowledge production (Collyer, 2018). There are structural and systemic inequities unique to the Global South. For example, examining the redistributive principle more closely, an application of this principle would give thought to the differing levels of participation in open education in the Global South due to infrastructure challenges. These specific challenges include, as Hodgkinson-Williams and Trotter (2018) explained, "adequate buildings for instruction, uninterrupted power supply, functional technological equipment, affordable and stable connectivity and access to requisite educational materials" (p. 207). Furthermore, a social justice lens considers some of the origins of the present infrastructure challenges in the Global South, such as colonialism and imperialism, instead of positioning the inequities as innate to these populations. We welcome a response and critique of the SCOPE framework in the context of the Global South.

Learners with disabilities will likely experience open education differently as a function of the systems in place that perpetuate inaccessibility. As part of redistributive justice, open education, both in terms of resources and pedagogies, needs to be accessible across functional diversity needs. Unfortunately, most OER do not meet accessibility guidelines and accessibility does not tend to be a priority when considering adopting OER (Azadbakht et al., 2021; Schultz & Azadbakht, 2021).

Finally, a commitment to social justice in open education research and practice means engaging in critical self-reflection and avoiding anti-essentialism in the interpretation of research findings. A part of this critical self-reflection is asking whether the researcher is conducting research *about* a community versus conducting research *for* or *with* a community. This critical self-reflection also involves examining their role with respect to power and privilege in the research process. Researchers with a social justice orientation

understand how broader systems and social situations affect their participants differently depending on their context and background. Not all students, for example, will be affected by open education in the same way. A commitment to social justice also means revisiting previous open education conceptualizations and having potentially uncomfortable conversations. Wiley's (2014) 5Rs framework provided a helpful foundation to the conceptualization of OER, which argues a resource is generally considered open if the user is able to retain, reuse, redistribute, remix, and/or revise for their specific learning situation. A social justice application of the 5Rs would ask questions such as, "In what situation would altering OER content create or hinder liberation for marginalized communities as a whole?" and "Who has the power and access to edit, retain, redistribute and/or remix OER and how do we create networks and resources for distribution equity?" (Adams & Dannick, 2022; Hollich, 2022).

Cost

Cost refers to the loss assumed to be either due to or avoided by open education (Bliss et al., 2013). In the COUP framework, cost in open education has traditionally focused on the financial cost savings of OER, which are available in digital formats without access fees, as compared to commercial materials, which tend to be very expensive for students (e.g., Farrow et al., 2020). Another conceptualization of cost considers institutional savings through lower course withdrawal rates with courses using OER, specifically open textbooks, compared to commercial textbooks. OER may be linked to less time searching for less expensive alternatives to commercial textbooks, which indicates a lower time cost for students (Katz, 2019). The cost of faculty time and effort to adopt OER has also been examined as a barrier to OER adoption (Belikov & Bodily, 2016; Thomas & Bernhardt, 2018). These aspects of costs traditionally examined are important when considering how to ease the burden of postsecondary education to support student success through OER adoption.

As the field has grown to expand its focus to open pedagogy, K–12, and informal learning, the broader conceptualizations of costs must also be considered in the SCOPE framework. Expectancy-value-cost theory may be informative in this regard (Barron & Hulleman, 2015). According to the expectancy-value-cost theory, one's motivation for a task is the product of their expectancy to successfully complete the task and the value of that task subtracted by the cost of that task. In this theory, cost includes the aforementioned components of finances and time as well as emotions, opportunities (loss of alternatives to the task), and effort (Flake et al., 2015). Inquiry in this regard could explore the emotions of open education, particularly as students encounter novel pedagogies that incorporate open licensing. For example, students may find it anxiety provoking to consider openly licensing their assignments for others to use.

Cost has been further conceptualized to include the processing demands on cognitive resources (e.g., working memory) known as cognitive load (Feldon et al., 2019). Cognitive load theory is helpful to consider when designing both OER and open pedagogy assignments. OER design features may increase cognitive load and subsequently learning would be less efficient as there are fewer cognitive resources to attend to the content (Paas & Merriënboer, 2020; Sweller, 2020). Importantly, open pedagogy assignments may cause undue burden on cognitive load if the instructions are confusing to students and collaboration with peers (considered a component of open pedagogy; Hegarty, 2015) is cumbersome (Janssen et al., 2010; Janssen & Kirschner, 2020). Clear assessment criteria may lessen cognitive load and improve learning (Krebs et al., 2022). Furthermore, assignment transparency in open pedagogy may be helpful for reducing

unnecessary cognitive load. Assignment transparency is communicating the purpose, steps, and resources for completing an assignment in the assignment directions (Winkelmes et al., 2019). Logically, if students' cognitive resources are not focused on trying to understand how to do the assignment, there would be more cognitive resources available to perform well on the assignment.

Lastly, a less considered, but extremely important cost is the social and political costs of marginalized scholars engaging in open work, including BIPOC and LGBTQ+ scholars. For example, Finley et al. (2018) discussed the particular vulnerability that faculty of color face in writing or researching race-related issues or talking about such topics in the classroom. Furthermore, there is increased political hostility toward race-conscious and LGBTQ-inclusive education (Kaerwer & Prichett, 2023). Open education advocates, scholars, and practitioners need to be mindful of the differing risks when asking marginalized faculty to consider "open" as a practice in their research and teaching as institutional support and protection for these communities to fully participate is often lacking. Furthermore, open education practitioners need to apply a more critical conscious lens in order to consider what kind of support and networks are necessary to truly protect and advance the open work of scholars from vulnerable populations.

Outcomes

Outcomes refer to the presumed effects due to open education with the focus generally on students' academic outcomes (Bliss et al., 2013). A critical concern when the open education movement began was whether OER would be as effective as commercial resources regarding academic outcomes. Based on three syntheses of research findings, students' grades are similar whether using OER textbooks or commercial textbooks (Clinton & Khan, 2019; Hilton, 2016, 2020). These findings have been replicated in studies since these syntheses (e.g., Clinton-Lisell, 2023; Fialkowski et al., 2020; Howard & Whitmore, 2020; Nusbaum et al., 2020; Samson et al., 2021; Wynants & Dennis, 2022). Course enrollment intensity, which is the number of credits in which students enroll in a given term, has also been considered as an outcome of OER adoption. The logic behind examining course enrollment intensity is that the reduced financial burden of OER relative to commercial resources enables students to afford more credits per term. Indeed, there is evidence that OER adoption is positively associated with the number of credits enrolled in during a term (Griffiths et al., 2022). However, more examination of how open educational resources relate to outcomes for groups historically underserved in education is needed. Furthermore, more inquiry into K–12 is needed given lack of exploration in these areas (Blomgren & McPherson, 2018; Otto et al., 2021).

One critical area for inquiry in terms of students' academic outcomes is open pedagogy in which students are creators and editors of resources for others to use (Clinton-Lisell, 2021). Thus far, one study has been published in which student learning outcomes in a course with an open pedagogy assignment were compared to outcomes in a course without an open pedagogy assignment (Tillinghast et al., 2020). This study found comparable learning outcomes in the two course sections. Further work with similar designs and additional student populations and disciplinary content is needed to comprehensively address how open pedagogy relates to student learning outcomes.

Outcomes should be considered for faculty and academic staff who adopt OER, create OER, and/or incorporate open pedagogy into their teaching. Many institutions have had initiatives to provide financial incentives and training for faculty to adopt or create OER (McGowan, 2020). Some faculty have reported

experiencing an impact and transformation in their teaching practices as a result of adopting OER (Pitt, 2015). Moreover, faculty felt using OER in their classroom provided them with more autonomy to their pedagogy and claimed that adopting OER helped in accommodating diverse learners and developing a critical consciousness (Pitt, 2015). While faculty tend to positively view incentives to adopt OER, they are hesitant about creation of OER (Todorinova & Wilkinson, 2020). This may be due to the time and effort involved in OER development—particularly for faculty seeking promotion and/or tenure (Blankstein, 2022). Consideration of how to incorporate open education work to support faculty outcomes in terms of retention, promotion, and tenure may be critical to expanding the use and creation of OER and open pedagogy in higher education.

Perceptions

Perceptions refer to impressions and opinions of open education (Bliss et al., 2013). Similar to outcomes, perceptions of quality have been a longstanding concern about open education. The conclusions of reviews of students have typically indicated similar or better perceptions of OER quality compared to commercial textbooks (Clinton, 2019; Hilton, 2016, 2020). When considering academics' perceptions, concerns about quality may be seen as a barrier to OER adoption (Adil et al., 2022), although some faculty perceive benefits in terms of flexible licensing allowing modifications (Lantrip & Ray, 2021). The majority of studies on open pedagogy have involved student perceptions with findings generally indicating positive experiences with the technique (Clinton-Lisell, 2021). However, continued inquiry into perceptions of open education, particularly grounded in theories (e.g., Werth & Williams, 2021), is valuable considering the evolving nature of both online resources in education (many previous studies compared online OER to hard-copy commercial books) and open pedagogy.

There is evidence from controlled experiments that students perceive faculty who use OER more positively than faculty who use commercial resources. In these studies, students read hypothetical examples of professors and were randomly assigned to read a version of the professor who used an OER or commercial resources (Nusbaum & Cuttler, 2020; Vojtech & Grissett, 2017). These studies provided valuable insights (Curby et al., 2020; Fan et al., 2019), but studies examining actual student evaluations of teaching should be conducted and published. Student evaluations of teaching are an important aspect of many institution's criteria for faculty retention, promotion, and tenure.

Engagement

We propose the term engagement to refer to fully participating and being actively involved in open education. Tillinghast and colleagues (2020) have proposed adding engagement into the COUP framework (i.e., the COUPE framework) given the importance of engagement for students to succeed. In this way, engagement may be used to expand on "use" in the COUP framework to consider how deeply students were involved in an aspect of open education.

Theoretically, engagement may be categorized as behavioral, affective (emotional), cognitive, or agentic (Fredricks et al., 2004; Reeve & Tseng, 2011). Behavioral engagement is focusing and persevering in a task (Fredricks et al., 2004). In open education, behavioral engagement has been examined through the time spent reading or viewing materials (e.g., Kim et al., 2020) as well as using resources such as study aids (Clinton, 2018; Jhangiani et al., 2018). Learning analytics (examining the data students produce during

digital activities) may be useful to examine behavioral engagement (Clow, 2013; Kew & Tasir, 2022; Kim et al., 2020). Affective engagement involves emotions that may facilitate learning, such as excitement (Reeve, 2012). This may be a particularly useful area to examine in open pedagogy to better understand how students emotionally engage with these novel approaches. Cognitive engagement involves using strategies to optimize learning (Reeve & Jang, 2022). There has been some inquiry into OER using self-reports of learning strategies (Clinton, 2018; Jhangiani et al., 2018. It would be helpful to examine what strategies students engage in during open pedagogy assignments as well. Agentic engagement is contributing to the learning activity in an intentional and productive manner (Reeve & Jang, 2022). This category of engagement is clearly relevant to open pedagogy in which students are knowledge creators.

Future Inquiry Needed Across the SCOPE Framework

Across these five proposed components of the SCOPE framework, there are areas of open education that need examination due to critical or emerging importance. A rapidly growing concern is online homework systems for which students need to purchase access codes. Faculty use of these online homework systems has increased dramatically since the pandemic shutdown of March 2020, perhaps due to commercial publishers temporarily having these homework systems available without financial costs during the rapid shift to virtual learning (Nagle & Vitez, 2021). It is currently not well understood how these commercial online homework systems compare to open education, and the SCOPE framework may be useful to guide inquiry into this area. Inclusive access is also an area of emerging importance and concern. Inclusive access involves having the cost of commercial materials directly billed as part of tuition or fees, provided the cost is less than market rates (Thomas et al., 2022). This is intended to lower the financial burden of course materials for college students. However, these materials do not have the flexibility and rights to retain that are afforded through open licensing used in OER and would likely disproportionately harm students enrolled in courses and disciplines that historically have lower cost thresholds for materials. There has been some initial inquiry into inclusive access and student academic outcomes (see Spica, 2023), but direct comparisons with open education (both resources and pedagogy) are needed. Finally, artificial intelligence has rapidly become a critical area of need for research in all of education (Hwang & Chien, 2022; Ouyang et al., 2022), including open education.

There is a need for future quantitative research studies in open education to embrace a QuantCrit perspective. QuantCrit (shortened version of quantitative critical race theory) is a methodological approach in which quantitative data are collected and statistically analyzed through the lens of critical race theory (Gillborn et al., 2017). A key principle in this is that, rather than being objective, quantitative data are collected and analyzed in a socially constructed manner (Gillborn et al., 2017; Sablan, 2019). This is practiced through data analysis that mindfully considers race and other socially constructed groups of peoples historically marginalized by society (Castillo & Gillborn, 2022; Crawford, 2019). Moreover, limitations of research findings for those who have been historically underserved by educational systems must be acknowledged explicitly (Young & Young, 2022). Open education research data and materials should be available whenever possible for others to consider through their own analyses and interpretations (Grahe et al., 2020; Young & Young, 2022). This need for research transparency coincides with the open scholarship and science movements. Imperative in this work is holding responsible systems that created inequities in interpretations of research findings (Gillborn et al., 2017; Young & Young, 2022).

Conclusions

We acknowledge that there is inherent overlap in the SCOPE framework components and do not recommend attempting to silo these issues without considering their relations to each other. This is particularly important when considering how social justice issues may lead to varying experiences in cost, outcomes, perceptions, and engagement depending on identities and the intersectionality of these identities. Developed by Crenshaw (1991), intersectionality refers to how several forms of oppressions come together and compound given an individual's multiple identities. Rather than compartmentalizing or neatly separating identities, Kouzoukas (2019) stated the framework examines the joining of the identities and how systems of oppressions converge at the intersections (e.g., examining the racialized AND gendered realities of Black women, rather than examining this solely from a racial or gendered perspective). The effect of compounding systems of oppression creates differing experiences for marginalized people doing open education work. For example, the cost of time for the responsibilities of open education may be experienced differently by women of color (Jordan, 2022) who are often disproportionately tasked with service work in educational systems (Domingo et al., 2022; Rideau, 2021). In addition, perceptions of open education intended to enhance recognitive or representational justice, particularly for those from groups historically underserved in higher education, should be considered (see Nusbaum, 2020, for an example).

OER and open pedagogy were the focus of research areas presented in this article. However, open education overlaps both philosophically and in practice with open assessment, open data, open access publications, open scholarship and science, and massive online open courses. There has been insufficient cross-collaboration across these components (Weller, 2020, 2022); however, the SCOPE framework could provide a means of connecting various aspects of open. For example, both OER and open-access publishing involve removing barriers to knowledge.

The SCOPE framework is proposed to both structure and guide future inquiry into open education. Importantly, existing theories of social justice, motivation, cognition, and engagement are incorporated into the SCOPE framework to suggest foundations for future research. This is important given that open education research has been criticized for lacking depth in its theoretical inquiry (Wiley, 2021). We acknowledge that open education is an evolving field and, subsequently, its frameworks, such as the SCOPE, need to be flexible and evolve with it. Our intention with this proposed framework is to deepen the theoretical grounding of open education research while placing social justice at the forefront.

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Integrating Community of Inquiry Framework Principles With Flipped Classroom Pedagogy to Enhance Students' Perceived Presence Sense, Self-Regulated Learning, and Learning Performance in Preservice Teacher Education

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Abstract

The purpose of this study was to assess the effectiveness of integrating community of inquiry (COI) framework principles with flipped classroom pedagogy to enhance students' perceived presence sense, self-regulated learning, and learning performance. A quasi-experimental study was conducted to examine whether integrating COI framework principles with flipped classrooms could enhance college students' perceived presence sense, self-regulated learning, and learning performance. The participants were 64 third-year male college students in an online course at a teacher education university in Iran in 2021. The study employed the COI Survey, the online self-regulated learning questionnaire (OLSQ), and a teacher-made test to measure learning performance. The results indicated significant between-group differences in perceived presence sense, self-regulated learning, and learning performance ($p < 0.001$). Integrating COI framework principles with flipped classroom pedagogy was an effective approach to enhancing perceived presence sense, self-regulated learning, and learning performance among teacher education students.

Keywords: online education, flipped classroom, community of inquiry, self-regulated learning, teacher education

Introduction

As the importance of online education increases, it is essential for future teachers to create and manage effective online learning environments. Therefore, during their preservice course, educators should become familiar with the educational and design-related components of online learning. To teach and learn online, both current and future teachers must complete teacher education programs and take part in professional development programs. However, the dropout rate of students due to the absence of outside support in the virtual classroom is the biggest concern. In asynchronous online learning environments, students must monitor themselves and receive no interactive instruction, resulting in education postponement or dropout (Park & Choi, 2009). As online settings promote self-directed learning, online students are required to be more independent (Serdyukov & Hill, 2013). Therefore one of the required skills for success in such learning environments is self-regulated learning ability (Hu & Driscoll, 2013). Many educators advocate the flipped classroom model, in which class time is dedicated to active learning approaches while advanced technologies are leveraged for external classroom events, where students can access online video lectures prior to class (Bergmann & Sams, 2012). There have been several studies conducted on the effectiveness of the flipped classroom model (Hew & Lo, 2018; Kazanidis et al., 2019). The objective of this study was to explore the potential of integrating principles of the community of inquiry framework (COI) with the flipped classroom model to determine whether this blended pedagogy might maximize the benefits of the flipped classroom to improve learning outcomes among Iranian teacher education students.

Background

Research has shown that self-regulated learning (SRL) is crucial in determining students' successful learning experiences in an online learning environment (Cho & Kim, 2013). In addition, past literature has shown that students may not always successfully regulate their own learning, especially in technology-based learning environments (Lee et al., 2009). As a result, students need intensive instructional support, such as modeling, coaching, and scaffolding for the development of SRL in technology-based learning environments (Azevedo & Hadwin, 2005; Chen et al., 2013). As an initial support method for developing self-regulated learning, teachers can use the flipped classroom to help students develop their self-regulated learning through help-seeking.

Flipped Classroom

Flipped classrooms employ active learning techniques and technology, such as watching online video lectures prior to class (Bergmann & Sams, 2012). In flipped classrooms, learners make use of resources outside of scheduled class time (e.g., detailed notes, recorded lectures, other appropriate tools), and during class, are encouraged to work collaboratively and interactively on activities related to these materials (Butt, 2014).

Advantages of Flipped Classrooms

Studies have demonstrated that flipped classrooms can enhance student' collaboration, creativity, and task orientation (Strayer, 2012), as well as their ability to think critically and develop information literacy (Kong, 2014), and improve learning achievement (Missildine et al., 2013). The use of the flipped classroom model

helps learners become more aware of their need for external help in their studies as well as identify individuals who can assist in resolving their academic problems. If teachers wish to help students develop the self-regulation skill of actively raising questions, in addition to giving the learners the option to choose, they should also consider using the flipped classroom model. This model provides learners with sufficient opportunities to interact with the teachers and their peers, while teachers can also provide learners with guidance and assistance in person. It is suggested that if the resources and environments allow, educational practitioners should assign a sufficient number of TAs to assist with the in-class activities during the flipped classroom instruction.

Drawbacks of Flipped Classrooms

Several studies have identified some drawbacks of flipped classrooms, including taking up teachers' time and making learning more difficult (Mason et al., 2013). To participate fully in flipped classroom activities, students must watch and listen to the online content provided by their teachers. Nevertheless, not all students may benefit equally from video lectures or other multimedia formats (Filiz & Kurt, 2015). Consequently, it is imperative to comprehend that solely assigning students to watch online materials without any accompanying support before participating in a flipped classroom is inadequate. (Horn, 2013). In flipped classrooms, teachers should trust learners to watch lectures at home. Relevant literature (Ash, 2012; Rivera, 2015; Thoms, 2012) has concluded that the flipped method is lacking in terms of interaction and feedback processes during the individual learning phase. Researchers discovered that some students forgot to ask questions if they had to wait until the following week to speak with their teacher about a video they did not understand (Ng, 2018), and Enfield (2013) has argued that students miss the opportunity to quickly correct errors and misunderstandings. Flipped learning models cannot guarantee that students will cooperate or follow instructions; most students would spend hours watching lectures. As well, flipped classrooms may result in numerous learning problems since not everyone possesses the requisite computer skills (Akçayır & Akçayır, 2018).

Community of Inquiry Framework

Enhancing the online learning experience requires creating and maintaining a learning community (Akyol et al., 2009). To achieve this goal, the COI framework created by Garrison et al. (2001) has been extensively applied and explored. Drawbacks to the flipped model, especially lack of interaction and feedback in the pre-class processes, regarded as a major limitation of this approach (Antonio, 2022; Rivera, 2015), may be addressed by the community of inquiry framework. It offers a promising approach for designing pre-class activities in flipped learning models in terms of promoting interaction and feedback among students. COI has been frequently applied for using technology within a constructivist learning design. According to Garrison et al. (2010), students learned collaboratively and as a group in an inquiry community when there was shared cognitive, social, and teaching presences. According to this framework, these fundamental components interact to provide successful learning within a community. Although there have been studies in which the flipped learning approach was designed within the COI framework (Antonio, 2022; Ay & Dağhan, 2023; Günbatar, 2021; Jia et al., 2021), none of these studies integrated COI principles into all stages of the flipped model. Instead, emphasis was placed on designing the pre-class activities. There is a need for further investigation, especially since no research has explored the effect of the flipped model integrated with COI principles on learners' self-regulated learning and learning performance in in preservice teacher education. By integrating the COI as a theoretical framework with flipped classroom

pedagogy, we designed and developed a new online collaborative learning flipped classroom to maximize the benefits of flipped classrooms and address its weaknesess. To reveal the effects of the specially designed flipped classroom model on students' perceived sense of presence, self-regulated learning, and learning performance, the following three research questions were formulated.

Between the two instructional methods (i.e., flipped integrated with COI principles and conventional flipped) were there any differences in

1. perceived sense of teaching/social/cognitive presences?
2. self-regulated learning?
3. learning performance?

Methodology

Participants and Setting

A quasi-experimental quantitative intervention was conducted for this study. The participants were 64 males who were third-year students in an online course offered at a teacher education university in Iran in 2021; they ranged in age from 18 to 22 years (M = 19 ± 0.23). The students were recruited from two intact classes of the same course, taught by the same instructor, and were randomly assigned to the experimental (n = 31) and control (n = 33) group. This two-credit course lasted for 16 weeks; the course content covered various issues in educational planning. In the experimental group, the course was designed and delivered in a flipped classroom model integrated with COI framework principles, while the control group was taught through a conventional flipped model. A learning management system (LMS) was used to present the course and instructional material. It allowed for both synchronous and asynchronous communications between instructor and learners in various forms, including voice, video, and text; it also included online synchronous and asynchronous forums with options for public and private discussions. All necessary notifications for the start time of classes, exams, and learning resources, such as related articles, PowerPoint files, and recorded sessions, were available on this learning platform.

Data Collection Instruments

Data were collected using a survey, questionnaire, and a teacher-made test.

Students' perceptions of community of inquiry principles and its three presence types were measured using COI Survey, originally developed by Arbaugh et al. (2008) and adapted and validated by Taghizade et al. (2018) for an Iranian context. The survey consisted of 34, 5-point, Likert-type items (13 or teaching presence, 12 for social presence, and 9 for cognitive presence). It demonstrated high reliability with a Cronbach alpha value of 0.92 for teaching presence, 0.89 for social presence, 0.93 for cognitive presence, and 0.96 for the whole scale.

The online self-regulated learning questionnaire (OSLQ) developed by Barnard et al. (2009), was adapted and validated by the Taghizade et al. (2020) for an Iranian context to gather data about students' perceptions of self-regulated learning in online learning settings. The questionnaire consisted of 24, 5-point Likert-type items and demonstrated high reliability with a Cronbach alpha value of .94, indicating acceptable internal consistency.

Finally, the teacher-made test included 20 multiple-choice questions with only one correct answer per question, was used to measure students' learning performance. It was taken directly from the textbook used for the two classrooms. Regarding reliability, the KR-20 reliability coefficient was calculated as .84 and .86 for the pre-test and post-test, respectively. The maximum score for the teacher-made test was 20 marks.

Design and Procedure

The instructional procedures for the study are depicted in Table 1. For the conventional flipped classroom, instruction included the following components.

Before the class, students were given pre-class assignments related to educational planning issues and video clips on the LMS to help them acquire knowledge relevant to the issues. These video lectures served to enhance learners' readiness and problem-solving skills by stimulating learners to search for and solve problems related to the content through frequent reviewing of videos (Tawfik & Lilly, 2015).

During the class, students participated in quizzes that assessed their knowledge acquired from pre-class activities and engaged in classroom debates using the group discussion method. During the debates, students were assigned to teams and were requested to discuss the problem, while the instructor supervised and guided learners and encouraged team members to participate in discussions. Through synchronous online discussions, learners were able to share and reflect on their ideas without time and space limitations, and learn from multiple perspectives to create knowledge through interactive dialogues (Lipponen, 2002). Branon and Essex (2001) have argued that prompt interaction and synchronous communication can facilitate feedback, support knowledge sharing, and improve brainstorming and decision making, all of which are considered critical skills for solving problems.

At the end of the class and after online group discussion, the team heads presented the answers orally, allowing other teams to change or complete their answers based on the new insights obtained through feedback from the instructor and other teams. Additionally, the students submitted reports that summarized how their opinions had changed after the debate. Such reports also included student self-assessment of their overall performance in the debate. According to Topping (2009), classroom discussions and oral assessment of peers enhanced learners' reflection on new situations, as well as self-awareness and assessment (Topping, 2009). Furthermore, instructor feedback has been shown to help learners clarify objectives, increase their commitment, and promote learning efforts (Hattie & Timperley, 2007).

In the experimental group, the course was designed and delivered in the form of conventional flipped classroom integrated with COI framework principles in order to facilitate and support each of three COI presences as well as learners' self-regulated learning and learning performance. Five teacher assistants (TAs) supervised the group activities and assisted students with questions. Connections among students, teacher, and TAs outside of class time were maintained through the use of *WhatsApp*.

Cognitive presence was facilitated by:

- creating problems with multiple solutions related to learners' experience
- providing an atmosphere that facilitated dialogue and critical resolution through encouraging learners to discuss and follow certain ideas within a continuous discussion forum
- establishing course regulations that fostered an inclusive space for diverse viewpoints

In addition, learners were encouraged to (a) search for information from various sources; (b)share their suggestions and previous experiences; (c) make connections between information obtained; (d) keep asking questions, create knowledge based on others' ideas, and justify suggested propositions; (e) defend and test new ideas or solutions; and (f) reflect on the results of the newly obtained ideas. Learners were asked to provide support to strengthen their suggested claim when they confronted contradictory evidence. To ensure that students could complete the tasks without missing any important components, a weekly announcement was posted every Sunday morning to remind them of weekly tasks. As well, videos that presented the expected outcome prior to demonstrating the steps for achieving the outcome helped clarify good performance, as opposed to videos that simply outlined procedures.

Social presence was facilitated by encouraging learners to use various paralanguages such as signs, capital letters, emoticons, and avatars to enhance emotional and interpersonal connectedness, as well as to share voice messages, images, and videos. Students were taught (a) social skills and the rules of connectedness prior to the course, (b) ways to determine the consequences of learning in order to enhance learners' stimulation, (c) to acknowledge and appreciate the other's participation to create an open relationship. To show consideration and appreciation for fellow learners, as well as to foster friendly relationships with them, students were encouraged to address each other by their first name. Students used group pronouns (e.g., we) when talking to the group to include all individuals; they were directed to determine the role of learners in each group prior to online discussion (i.e., leader, information collector, discussion organizer, and analyzer). Finally, they were encouraged to share personal anecdotes, work-related events, and incorporate emoticons.

Teaching presence was facilitated through:

- setting goals
- selecting of content and learning activities
- organizing working groups at the beginning of the course
- supervising the learners' purposeful participation and reflection
- recognizing needs, and directing and providing timely information
- distributing teaching duties and roles among learners

- recognizing other's misunderstandings
- synthesizing knowledge from different sources

Discussion was summarized after each session to show and provide links and structural signs to direct and guide learners, and to pave the way for learners to access the resources and related databases. Teaching presence was also facilitated by (a) recreating PowerPoint presentations and lecture notes in the LMS for learners to access, (b) providing guidance on how to use media effectively, (c) revising and commenting on learners' answers, and (d) preventing some learners from controlling discussions while stimulating inactive learners. Students were given sufficient time to do tasks, encouraged to make deadlines to do tasks, and provided with prompt answers to questions and problems. Teaching presence included showing genuine interest in helping students become engaged, giving periodic reminders to listen closely to or review material, and delivering high quality information to students about their learning.

Table 1

Procedures for Experimental and Control Groups

Week	Stage	Experimental group	Control group
1	Before the class	Pre-test, COI pre-survey, and self-regulated learning pre-survey	Pre-test, COI pre-survey, and self-regulated learning pre-survey
2 to 15	During the class	Conventional flipped classroom integrated with COI principles	Watch video lectures Conventional flipped classroom
16	End of the class	Post-test, COI post-survey, and self-regulated learning post-survey	Post-test, COI post-survey and self-regulated learning post survey

Data Analysis

Multivariate analysis of covariance (MANCOVA) was used for between-group comparisons of students' perceptions of the COI presences in each of the experimental and control groups in pre- and post-surveys. Univariate analysis of covariance (ANCOVA) was conducted for between-group comparisons of the students' self-regulated learning and learning performance in the experimental and control groups in pre- and post-surveys and pre- and post-test, respectively.

Results

Students' Perceived Sense of Presences

Descriptive statistics comparing the pre- and post-course surveys of students' perceived sense of presences in the conventional flipped and COI flipped groups indicated that in both types of instruction, the mean score of the post-survey was higher than that of the pre-survey (see Table 2). Also, the mean score of the

COI flipped (experimental group) was much higher than that of the conventional flipped (control group) in all sub-scales of the post-survey.

Table 2

Descriptive Statistics of Pre- and Post-Tests: Students' Perceived Sense of Presences

Variable	Experimental group				Control group			
	Pre-survey		Post-survey		Pre- survey		Post- survey	
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Teaching presence	32.06	6.12	57.39	7.86	33.87	5.92	42.77	4.19
Social presence	26.81	2.96	43.51	1.66	27.96	4.13	38.32	5.14
Cognitive presence	34.24	4.49	55.45	5.70	33.03	4.25	44.38	5.82

The multivariate analysis of covariance revealed an overall effect of the conditions on the students' perceived presence sense sub-scales (Wilks' $\lambda = 0.271$; $F\ (3, 57) = 50.99$; $p < .001$, $\eta 2 = 0.73$) indicating differences between two groups, in at least one of three dependent variables, was significant. Test of between-subject effects (see Table 3) indicated that by controlling for the pre-survey scores, the post-course survey scores of the COI flipped group was higher than that of the conventional group at a significant level ($p < .001$) in all sub-scales.

Table 3

Comparing Results of the ANCOVA for Perceived Sense of Presences

Source	Dependent variable	Type III Sum of squares	*df*	Mean square	*F*	Sig.	Partial Eta squared
Group	Teaching presence	3379.842	1	3379.842	86.389	<.001	.594
	Social presence	353.400	1	353.400	28.357	<.001	.325
	Cognitive presence	1855.164	1	1855.164	55.099	<.001	.483
Error	Teaching presence	2308.286	59	39.123			
	Social presence	735.281	59	12.462			
	Cognitive presence	1986.526	59	33.670			

Students' Self-Regulated Learning

Descriptive statistics comparing the pre-survey and the post-survey in the conventional flipped and COI flipped groups indicated that in both types of instruction, the mean score of the post-survey was higher than

that of the pre-survey (see Table 4). The mean score of the COI flipped group (M = 85.15) was much higher than that of the conventional flipped group (M = 73.45) in post-survey.

Table 4

Descriptive Statistics of the Pre- and Post-Surveys on Self-Regulated Learning

Variable	Experimental group (n = 33)				Control group (n = 33)			
	Pre-survey		Post-survey		Pre-survey		Post-survey	
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Self-regulated learning	64.93	7.34	85.15	12.18	60.83	8.60	73.45	9.52

Table 5 presents the result of ANCOVA. Controlling for the pre-survey, the experimental group (M = 85.15; SD = 12.18) scored significantly higher on self-regulated learning, F (1, 61) = 14.58; $p \leq .05$; partial η2 = .193, compared to control group (M = 73.45; SD = 9.52).

Table 5

Comparing Results of the ANCOVA for Self-Regulated Learning

Source	Type III Sum of squares	*df*	Mean square	*F*	Sig.	Partial Eta squared
Corrected model	2387.147	2	1193.573	10.014	<.001	.247
Intercept	4175.695	1	4175.695	35.033	<.001	.365
Pre-test	199.082	1	199.082	1.670	.201	.027
Group	1738.819	1	1738.819	14.588	<.001	.193
Error	7270.838	61	119.194			
Total	413995.000	64				
Corrected total	9657.984	63				

Students' Learning Performance

Descriptive statistics comparing the pre-test and the post-tests in the conventional flipped and COI flipped groups indicated that in both types of instruction, the mean score of the post-test was higher than that of the pre-test (see Table 6). The mean score of the COI flipped group (M = 17.30) was much higher than that of conventional flipped (M = 15.96) at post-test.

Table 6

Descriptive Statistics of the Pre- and Post-Tests of Learning Performance

Variable	Experimental group (n = 33)				Control group (n = 33)			
	Pre-test		Post-test		Pre-test		Post-test	
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Learning performance	2.90	1.58	17.30	1.79	3.09	1.39	15.96	2.25

Table 7 presents the result of ANCOVA. Controlling for the pre-test, the experimental group (M = 17.30; SD = 1.79) scored significantly higher on learning performance, F (1, 61) = 6.69; $p \leq .05$; partial η2 = .009, compared to control group (M = 15.69; SD = 2.25).

Table 7

Comparing Results of the ANCOVA for Learning Performance

Source	Type III Sum of squares	*df*	Mean square	*F*	Sig.	Partial Eta squared
Corrected Model	28.758	2	14.379	3.431	.039	.101
Intercept	3499.456	1	3499.456	834.899	<.001	.932
Pre-test	.258	1	.258	.061	.805	.001
Group	28.043	1	28.043	6.691	.012	.099
Error	255.680	61	4.191			
Total	18040.000	64				
Corrected Total	284.438	63				

Discussion

Students' Perceived Sense of Presences

According to the results, exposing students to flipped pedagogy enhanced their perceived sense of teaching, social, and cognitive presence in both groups over time. This finding is consistent with previous studies that the flipped classroom created a sense of all three presences in an educational setting (Lee & Kim, 2018). Our findings showed that at post-survey there was a statistically significant difference between learners' perceived sense of teaching, social, and cognitive presence in both the COI flipped and conventional flipped classroom. Prior studies have found similar results regarding cognitive presence (Chen & Chang, 2017; Darabi et al., 2011; Shea et al., 2010). Cognitive presence, which is rooted in critical thinking, provides a hierarchical framework for assessing learners' thinking processes and their abilities to achieve rich levels of learning. Cognitive presence leads the way to conceptualize, assess, and differentiate among varying levels of learners' critical thinking. Learners' cognitive participation to integrate, combine, and assess the discussion ideas is necessary in online discussions to create high-level learning in an interactive online setting (Shea et al., 2010). Attaining this goal calls for strategies that allow learners to create a community

of inquiry through which they can engage in a meaningful critical discussion; this requires cognitive presence.

According to Garrison and Arbaugh (2007), social presence is expected to become more prevalent as the course progresses. In the present study, both groups' social presence increased over time. Social presence reflects social dynamics and the quality of relationships between learners. In the present study, the online learning community, embodied in the authentic interaction and communication via *WhatsApp*, resembled the findings of previous studies in that the learners showed positive response to the flipped instruction (Lucke, 2014; Mortensen & Nicholson, 2014), because most precious instructional time was allocated towards clarification of meaning, problem solving, and interactive collaboration (Bishop & Verleger, 2013; Boucher et al., 2013). The educational videos viewed outside the classroom served as mechanism to "fill the vacuum" that instructors would otherwise have left (Tucker, 2012, p. 83), freeing class time for more advanced learning and engaging students in meaningful, interactive, and collaborative activities for deeper conceptual learning.

Regarding teaching presence, although the interaction between learners is essential in virtual learning environments, it does not guarantee effective online learning, according to Garrison et al. (2010). It is important to define clear parameters for these interactions, focusing on a certain direction, and this calls for elements of teaching presence. Online learning environments require teaching presence to reduce the distance between students and instructors. Teaching presence establishes and ensures a learning community functions consistently. The teacher's level of teaching presence is believed to be an indicator of the quality of online education. Data has shown that teaching presence quality, learning, and learners' satisfaction were strongly correlated in the experimental studies (Caskurlu, 2020). Online learning relies heavily on teaching presence. With a sufficient level of teaching presence, students were generally satisfied, and perceived a relatively high level of cognitive presence (Arbaugh, 2008; Khalid, 2014). Instructors' efforts (e.g., effective course design, the use of scaffolding strategies) have been shown to be crucial for students' perceptions of a COI (e.g., Garrison et al., 2010). The direct connection between instructors and students is relatively smaller than in traditional classroom teaching. Therefore, the interaction between students and instructors becomes more critical and should be more useful for helping students to gradually adapt to self-directed learning.

Students' Self-Regulated Learning

According to our findings, exposing students to flipped instruction promoted self-regulated learning in both groups over the time. Integrating flipped classrooms may improve students' self-regulated learning. The findings in this study were in line with those reported in previous literature including Sun et al.(2017), Silva et al. (2018), and Kustandi et al.(2020) that showed flipped instruction increased students' self-regulated learning.

These results may be attributed to the interaction ("teacher-student" and "student-student" "pre-class" and "in-class" interactions), that plays a key role in enhancing students' self-regulated learning, as well as improving their ability to organize their materials and clearly express themselves in flipped classrooms. Also, students in the flipped classrooms receive more feedback and instructions from their instructors in "pre-class" and "in-class" activities that will impact on learners' process of self-awareness. The significant

result is related to the facilitation of a learning model that motivated learners to proactively request external assistance through the LMS. Through the LMS platform, students used class time for practicing activities, and improving their learning and self-regulation skills (Nguyen & Ikeda, 2015). The results also indicated that the COI flipped classroom students had higher self-regulated learning scores compared to their flipped conventional group counterparts at post-survey. In our experimental group (the COI flipped classroom), online learning was combined with collaborative learning activities prior to and during their class in the LMS and *WhatsApp* and was further supported by guidance from the instructor and TAs. Based on the findings of past studies, peer discussions help transfer learning responsibility, driving self-learning mechanisms and improving learners' ability to self-regulate, thereby enhancing the effectiveness of self-regulation (Grau & Whitebread, 2012; Whitebread et al., 2007). Through teacher-student interactions as well as guidance and feedback provided by the instructor and TAs, learners improved both their self-awareness and the quality of their learning outcomes. This promoted their self-reflection and in turn supported meta-cognitive and monitoring processes (Labuhn et al., 2010; Perry et al., 2002). Also, the difference between experimental group and control group may also be attributed to the mode of learning. In the COI flipped classroom mode, *WhatsApp* provided opportunities for students to collaborate and engage in activities in order to obtain accurate feedback of their performance at a time of their own choosing. Instructors and mentors need to provide high-quality, goal-directed feedback to enable students to adjust their learning in a direction they desire. Moreover, simply providing feedback to students was not sufficient to build their learning presence; that represents elements such as self-efficacy as well as other cognitive, behavioral, and motivational constructs supportive of online learner self-regulation (Shea & Bidjerano, 2010), and they must also start to interpret that feedback through written self-reflection (Labuhn et al., 2010).

Students discussed new topics and concepts prior to class with other students and the teacher via *WhatsApp*. This increased their positive collaboration and may have also helped them engage with others confidently during class, and learn more effectively by working with their peers. This has been evidenced by class activities which also significantly affected students' learning experiences (Bergmann & Sams, 2012). Interactive learning environments such as LMS pique students' curiosity and with their teacher's support, their motivation and learning may also correspondingly increase.

Students' Learning Performance

The findings of the third research question showed that compared to the conventional flipped classroom, the COI flipped model promoted students' learning performance. Consistent with previous studies (Chen & Chang, 2017; Herrera & González, 2017; Pifarré et al., 2014) our results confirmed the positive effect COI framework strategies on students' learning performance. Since COI flipped pedagogy is rooted in constructivism, it is possible that the model from our study improved learning outcomes. According to Chiu et al. (2007), constructivist teaching strategies, with their emphasis on activity-based approaches, provided an enriched learning environment and improved high-level thinking skills, especially critical thinking. Several studies have demonstrated that the COI presences are an effective framework to show the factors that affect students' satisfaction with online learning (Arbaugh, 2008; Estelami, 2012; Khalid, 2014). Students' performance was influenced by the quality, not the quantity, of their interactions with their teachers, according to Pierce and Fox (2012). In the COI flipped instruction employed in the current study,

the instructor served more as a guide than an authority, and supported students to build confidence and learn actively.

Limitations

This study had several limitations. First, the dataset measured COI presences and self-regulated learning based on students' self-reported perceptions, an approach that is prone to response bias. Future studies should gather information from a variety of sources to verify students' self-reported data such as learning management systems, learning records, teacher perceptions, teacher and student interviews, and open-ended questions. Second, the data were gathered from a public university in Iran. To validate this research's generalizability, we recommend replicating it in other settings. Third this study used a convenience rather than a random sample, which reduced generalizability across settings. Finally, the associations between and among the data from the three instruments was not investigated. Instead, we examined each set of data independently of the other two sets.

Conclusion

This study extends the body of information already available about flipped classrooms to maximize their benefits for student learning and motivation. In addition to the flipped classroom model, this study demonstrated that a focus on COI can advance and deepen the learning in flipped classrooms.

Participants were motivated to participate more effectively and apply what they learned to authentic settings by engaging in constructive, collaborative, contextual, and self-directed activities before and during class. Generally, in flipped instruction, the online learning community positively impacts meaningful learning, facilitates positive interaction and collaboration, and significantly improves students' ability to participate in learning activities, such as in-class discussions and group presentations. Based on the results of this study, the integration of COI principles in the flipped classroom seemed to improve the flipped learning experience and pointed to more satisfying outcomes. This study examined a new instructional approach to engage students in a flipped classroom and promote active learning. This approach addressed some of the problems that arise when students are faced with a flipped learning environment, including disorientation, lack of self-regulation, and lack of adequate class preparation.

The COI framework has been widely used by researchers and educators to study the design and implementation of online learning (Garrison & Cleveland-Innes, 2005; Popescu & Badea, 2020; Tan et al., 2020). Results of previous research has consistently shown that the COI presences are an effective framework to reveal factors that affect students' satisfaction with online learning. In this study, we shed light on an area that has not been examined before—the connection between flipped instruction and COI components. We believe that such an approach can guide online teachers to understand effective online learning. Regarding the issue of supporting online learning environment in LMS with a user-friendly environment, the current study employed *WhatsApp*. Use of a user-friendly and easy-to-use social platform could enhance students' perceived levels of social presence, and in turn, facilitate cognitive and teaching presences. Such platforms can be used to support online learning communities to improve interaction, communication, and collaboration, and thereby improve the COI elements.

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The Effects of Exam Setting on Students' Test-Taking Behaviors and Performances: Proctored Versus Unproctored

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Abstract

One of the biggest challenges for online learning is upholding academic integrity in online assessments. In particular, institutions and faculties attach importance to exam security and academic dishonesty in the online learning process. The aim of this study was to compare the test-taking behaviors and academic achievements of students in proctored and unproctored online exam environments. The log records of students in proctored and unproctored online exam environments were compared using visualization and log analysis methods. The results showed that while a significant difference was found between time spent on the first question on the exam, total time spent on the exam, and the mean and median times spent on each question, there was no significant difference between the exam scores of students in proctored and unproctored groups. In other words, it has been observed that reliable exams can be conducted without the need for proctoring through an appropriate assessment design (e.g., using multiple low-stake formative exams instead of a single high-stake summative exam). The results will guide instructors in designing assessments for their online courses. It is also expected to help researchers in how exam logs can be analyzed and in extracting insights regarding students' exam-taking behaviors from the logs.

Keywords: test-taking behaviors, proctored exam, unproctored exam, formative assessment

The Effects of Exam Setting on Students' Test-Taking Behaviors and Performances: Proctored Versus Unproctored

Although online learning has been widely used, during the pandemic, many people who had never used this method experienced online learning in their educational lives for the first time. In addition to the many advantages of the widespread use of online learning, such as access, usefulness, and flexibility, its primary problems have been identified as participation, academic dishonesty, and access to digital devices and the Internet (Joshi et al., 2021; Lee & Fanguy, 2022). Effective course design is necessary for effective online learning, and the design of assessment and evaluation activities—one of the five main elements of the design process, which also includes an overview, content presentation, interaction and communication, and learner support—is very important (Martin et al., 2021). During the assessment design process, formative and summative assessment approaches can be used together or separately. Although both methods have their advantages and disadvantages, the assessment should be learning-oriented and support the learning process (Baleni, 2015; Bin Mubayrik, 2020). Student monitoring, improving learning, and performance increment are the fundamental dimensions of the assessment process (Fernandes et al., 2012; Gikandi et al., 2011). The assessment design process must be integrated into the instructional design process to ensure the students' well-being, as well as for the smooth and successful continuation of the overall process (Slack & Priestley, 2022).

It has been determined that the most challenging issues in online exams are cheating and dishonesty (Alessio et al., 2018; Chirumamilla et al., 2020; Singh & de Villiers, 2017; Vlachopoulos, 2016). Proctoring is one of the most used methods to prevent academic dishonesty. However, conducting face-to-face proctored exams in distance education is not always feasible. Online proctoring systems are also costly. Therefore, alternative methods are needed. Changing the assessment design can be an effective solution. When the assessment design is only summative, the main concern is to focus on problems such as cheating and dishonesty. However, when the assessment process includes formative assessment activities, students' dishonest behaviors may change. Therefore, this study aimed to compare the academic achievements and test-taking behaviors of students in proctored and unproctored tests within a course in which formative assessment was applied. The significance of this study is that it focused on students' actual system usage logs, as opposed to previous studies that focused on self-reported data (Chirumamilla et al., 2020; Snekalatha et al., 2021; Yazici et al., 2023).

The research questions for this study were as follows:

1. Is there a visual difference between the test-taking behaviors of students who take proctored and unproctored exams?

2. Are there any significant differences between the proctored and unproctored exams in terms of time spent on the first question, total time spent on the exam, and the mean and median times spent on each question?

3. Are there any significant differences between the proctored and unproctored exams in terms of students' exam scores?

Literature Review

Assessment Design, Cheating, and Dishonesty

Although they are defined as separate assessment methods, summative and formative assessments do not differ sharply from each other, are in a relationship, and are effective when integrated into a design in line with the learning and instructional goals and objectives (Arnold, 2016; Gikandi et al., 2011). Summative assessment consists of assessment activities at the end of the course, while the formative assessment process continues for the whole semester by giving regular feedback and combining several assessment tools (Arnold, 2016).

The use of effective methods in designing the assessment process, especially in online learning environments, is important for reducing cheating and dishonesty (Oosterhof et al., 2008). Various precautions may be taken to prevent cheating behavior in online learning environments. The most commonly used techniques are proctoring software (Lee & Fanguy, 2022; Nigam et al., 2021), biometric controls (Noorbehbahani et al., 2022; Traoré et al., 2017; Vegendla & Sindre, 2019), shuffling questions and choices (Tripathi et al., 2022), random drawing (Goedl & Malla, 2020; Thelwall, 2000), and sequencing (Chirumamilla et al., 2020).

Proctoring systems are artificial intelligence (AI)-based or human-based. In human-based online proctored systems, webcams and microphones are the main tools, but AI-based proctored systems consist of multiple cameras, full system controls, and recordings. In much research focusing on the use of online proctoring software, it has been determined that there is no significant difference in terms of the academic achievement, anxiety, and test-taking behaviors of students when compared to environments in which such software is not used (Rios & Liu, 2017; Stowell & Bennett, 2010). On the other hand, there have been studies that contradict these findings. The flexible conditions of proctored exams, including having the learning materials at hand and collaborating with peers, have resulted in higher exam scores and longer exam completion times when compared with unproctored environments (Alessio et al., 2018; Daffin & Jones, 2018; Goedl & Malla, 2020). In addition to academic dishonesty issues, most of these online proctoring software programs have used biometric data, which brings with it some ethical problems. Security and privacy issues in terms of data protection and usage are the main concerns when these tools have been used (Balash et al., 2021; Draaijer et al., 2018).

Online Exams and Log Data

It is noteworthy that the current literature has mostly focused on learners' and teachers' perceptions of online exams (Chirumamilla et al., 2020; Snekalatha et al., 2021; Yazici et al., 2023). These studies compared (a) how online exams and paper-based exams are perceived in terms of different cheating practices (Chirumamilla et al., 2020); (b) how online tests are perceived in terms of reliability, usefulness, and practical challenges (Snekalatha et al., 2021); and (c) the cheating-related behaviors reported by students themselves and those perceived by academicians (Yazici et al., 2023). These studies have provided some insights regarding current issues, but due to reliance on self-report data, it is controversial to what extent they reflect the real situation. The current literature has shown that there is an inconsistency between the self-report data and the system logs (e.g., Cantabella et al., 2018; Soffer et al., 2017). Besides, it does not

seem possible to explore the potential of online learning or assessment systems with self-report data. For this reason, it is important to examine students' test-taking behaviors through their actual interaction logs.

Students' behaviors as they use learning systems have provided a considerable amount of information about their cheating attempt, activity level over time and engagement with course materials (Alexandron et al., 2019) and their interaction with the content (Balderas & Caballero-Hernández, 2021; Dominguez et al., 2021; Jaramillo-Morillo et al., 2020; Pelanek, 2021; Trezise et al., 2019). In their study, Trezise et al. (2019) used keystroke logs and clickstream data to prevent contract cheating in a writing task. They analyzed the patterns of writing (including pause, delete, and revision activities) for free-writing, general transcription, and self-transcription tasks. Their findings showed that the writing patterns were differentiated for free writing when compared to the other two writing tasks. Alexandron et al. (2022) used their algorithms—which employ clickstream data such as video events (e.g., play, pause), responses to assessment items, and navigation between course pages—for a massive open online course competency exam model. They found that this exam model reduced cheating in this formative assessment design.

Learning management systems (LMS) keep all student and instructor transactions on the system in their own databases. These logs can also be used as part of the assessment process. The disclosure of students' test-taking behavior facilitates the identification of their trial-and-error strategies, detects cheating (Man et al., 2018), and provides prompt feedback to support their learning (Hui, 2023). As emphasized in the literature, it is expected that cheating behavior will occur less in an online course that includes assessment activities prepared with an appropriate design. Accordingly, in this study, student behaviors in a course designed based on formative assessment approach were analyzed by examining the system logs.

Method

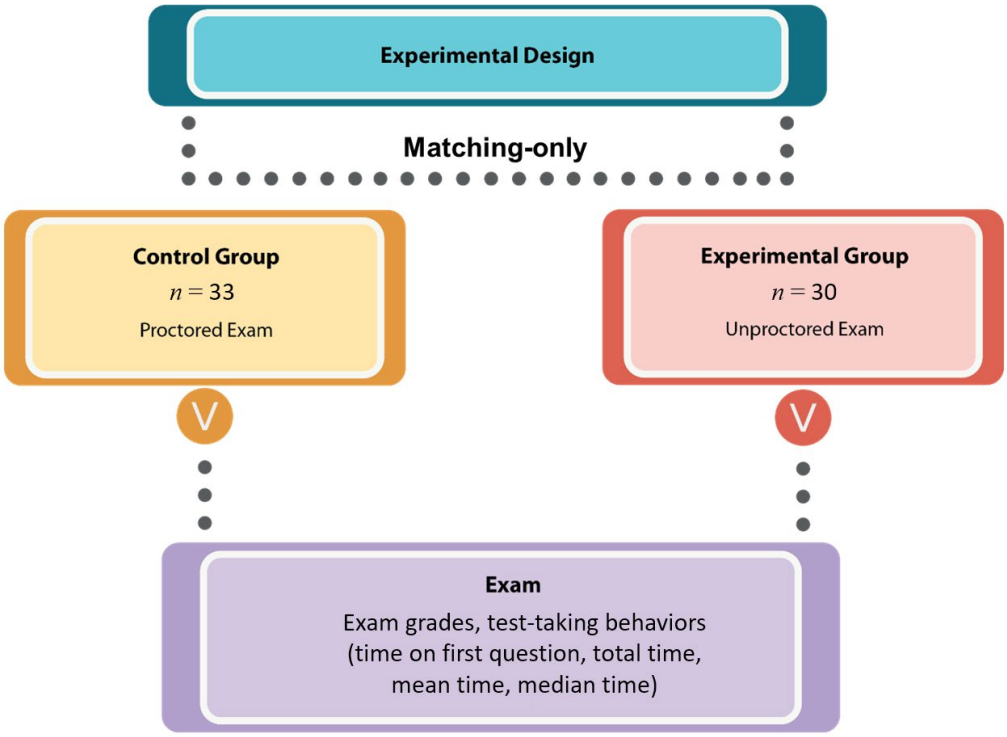
This research was conducted by way of a quasi-experimental design with the matching-only posttest-only control group. A quasi-experimental design is applied in cases in which the sample in the selected population cannot be randomly selected (Fraenkel et al., 2012).

While the control group took the exam online with face-to-face proctoring in a laboratory environment, the experimental group had the flexibility to take the exam from anywhere—everyone was able to access the exam from their own device, and there was no proctoring mechanism. The experiment considered that the students had various levels and quality of Internet access. Due to the nature of exam applications in online environments, this situation can never be controlled (Figure 1).

Experimental and control groups were matched based on a prior knowledge test. There was no significant difference between the two groups (M Control = 31.76; SD Control = 13.15; M Experiment = 32.94; SD Experiment = 13.07; F = .078; p = .781).

Figure 1

Experimental Design



The study group consisted of first-year students enrolled in different undergraduate departments of the faculty of educational sciences at a state university. Through an online survey, both an integrity endorsement and permission to use log data were obtained from the students. A total of 63 students participated in the study.

The experiment was carried out during the implementation of the fourth quiz during the fifth week. The course unit was titled Word Processing Programs. This quiz was chosen because students had to gain experience in previous quizzes to minimize problems using the system.

Course Design

This study was conducted in the *Information Technologies* course and included topics such as computational thinking, problem-solving concepts and approaches, basic concepts of software, and office programs. The course instructor was an experienced university instructor. The syllabus of the course was introduced to the students at the beginning of the semester. The course was conducted face-to-face for nine weeks and online for five weeks (the course alternated in a repeating pattern of two weeks face-to-face followed by one week online). Moodle LMS was used in the online learning process. In the first week, the students were informed about how the course would be taught and the assessment criteria. In Moodle, students had access to topic videos (n = 60; average 6 minutes), PDFs (n = 7), and external resources (n =

6) every week. The students completed two discussion activities in the first week, as well as four quizzes and two peer assessment activities in the other weeks. Each of the assessment activities (i.e., quiz, peer assessment, and exams) was weighted to calculate the students' learning performance. Each student's end-of-term grade was calculated based on the scores of four quizzes (each quiz 10%; total 40%), a peer assessment activity (10%), and a face-to-face proctored final exam (50%).

Moodle LMS provided a range of options regarding exam settings. In this study, the same settings were used for both the control and experimental groups. Students were allowed to take the exam only once and within the specified time period. The exam duration was planned as 1.5 minutes per question and set to a total of 30 minutes. The 20 questions were presented in random order for each student, and the answer choices were also shuffled. Students were not allowed to navigate freely between questions.

Data Preprocessing

Three data sources were used: (a) prior knowledge test, (b) quiz scores, and (c) students' exam logs from the Moodle database. Data on students' activities during the exam were recorded in different tables in the Moodle database (Table 1).

Table 1

Moodle Database Used for Data Analysis

Moodle table	Children table	Parent table	Number of columns	Comments
quiz_attemps	-	Quiz user	15	Stores users' attempts at quizzes
logstore_standard_log	-	Context user course	21	Standard log table

The data from the quiz_attempts and logstore_standard_log tables were used to analyze students' quiz-taking behaviors. The data preprocessing was carried out automatically with the help of a tool the researchers developed. The main function of this tool was to automatically process the log records by converting them into meaningful features. In the logstore_standard_log table (Table 2) in which all the interactions of the students in the Moodle LMS were recorded, the students' quiz logs were retrieved in relation to the attempt ID. In the analyzed exams, sequential navigation ensured that students could not return to a question that they had previously answered or left blank. There were four actions associated with the exam: (a) start the exam, (b)view questions, (c) submit the exam after viewing all the questions, and (d) review the answers. The target field indicated which Moodle component the action was related to. For example, viewing each question was an attempt. The time of each action was written in the time created field as Unix epoch time (Epoc Converter, n.d.). So, as illustrated in Table 2, the difference between the time created value between any two rows represented the time a student spent on a question. The records in the logstore_standard_log table for each student were taken, and the calculations for the features detailed in the Feature Extraction section were made. In the obtained analysis file, each student was in a row, while the columns included data about that student's features.

Table 2

Sample Exam Log for a Student

İd	action	target	time created
27734600	started	attempt	1637667708
27734601	viewed	attempt	1637667708
27734706	viewed	attempt	1637667721
27735149	viewed	attempt	1637667798
27736528	viewed	attempt	1637668011
27737115	viewed	attempt	1637668089
27737718	viewed	attempt	1637668177
27738176	viewed	attempt	1637668235
27738704	viewed	attempt	1637668302
27738879	viewed	attempt	1637668328
27738979	viewed	attempt	1637668343
27739283	viewed	attempt	1637668380
27739445	viewed	attempt	1637668396
27739688	viewed	attempt	1637668419
27739831	viewed	attempt	1637668436
27740402	viewed	attempt	1637668513
27740644	viewed	attempt	1637668545
27740799	viewed	attempt	1637668568
27741041	viewed	attempt	1637668598
27742131	viewed	attempt	1637668718
27742278	viewed	attempt	1637668737
27742620	viewed	attempt_summary	1637668770
27742675	submitted	attempt	1637668775
27742680	reviewed	attempt	1637668776

Feature Extraction

While determining the features, the students' exam logs were analyzed, and attributes were selected to reflect students' exam-taking behaviors. Typical test-taking behavior includes starting the exam on time, and completing the exam by progressing regularly (i.e., the average time spent on each question is similar). Behaviors such as starting the exam late, spending more time on the first question than the others, or answering most of the questions in a noticeably short time are unusual. For this reason, time spent on the first question, total time spent on the exam, average time spent on each question, and median time spent on each question were selected as features. The extracted features and their descriptions are presented in Table 3.

Table 3

Features Related to Students' Test-Taking Behaviors

Feature	Description
Time(s) on first question	Time spent on the first question on the exam
Total time(s)	Total time spent on the exam
Mean time(s)	Mean time spent on each question
Median time(s)	Median time spent on each question

With help from a tool developed by the researcers, the data related to these features were extracted automatically for each student in the experimental and control groups and recorded in the file to be used for further analysis. In addition to these features, the students' exam scores and prior knowledge scores were added to the dataset to test the equivalence of prior knowledge and exam performances.

Data Analysis

Visualization and statistical methods were used in the data analysis. Data visualization methods were used to answer the first research question. The Mann-Whitney U test was used to determine whether there was a difference between the experimental and control groups in terms of exam scores and test-taking behavior variables within the scope of the second and third research questions. R software and the ggplot2 library were used to visualize the test-taking behaviors of students in proctored and unproctored environments. Statistical analyses were performed using the SPSS program.

Results

The results are organized by each of the three research questions.

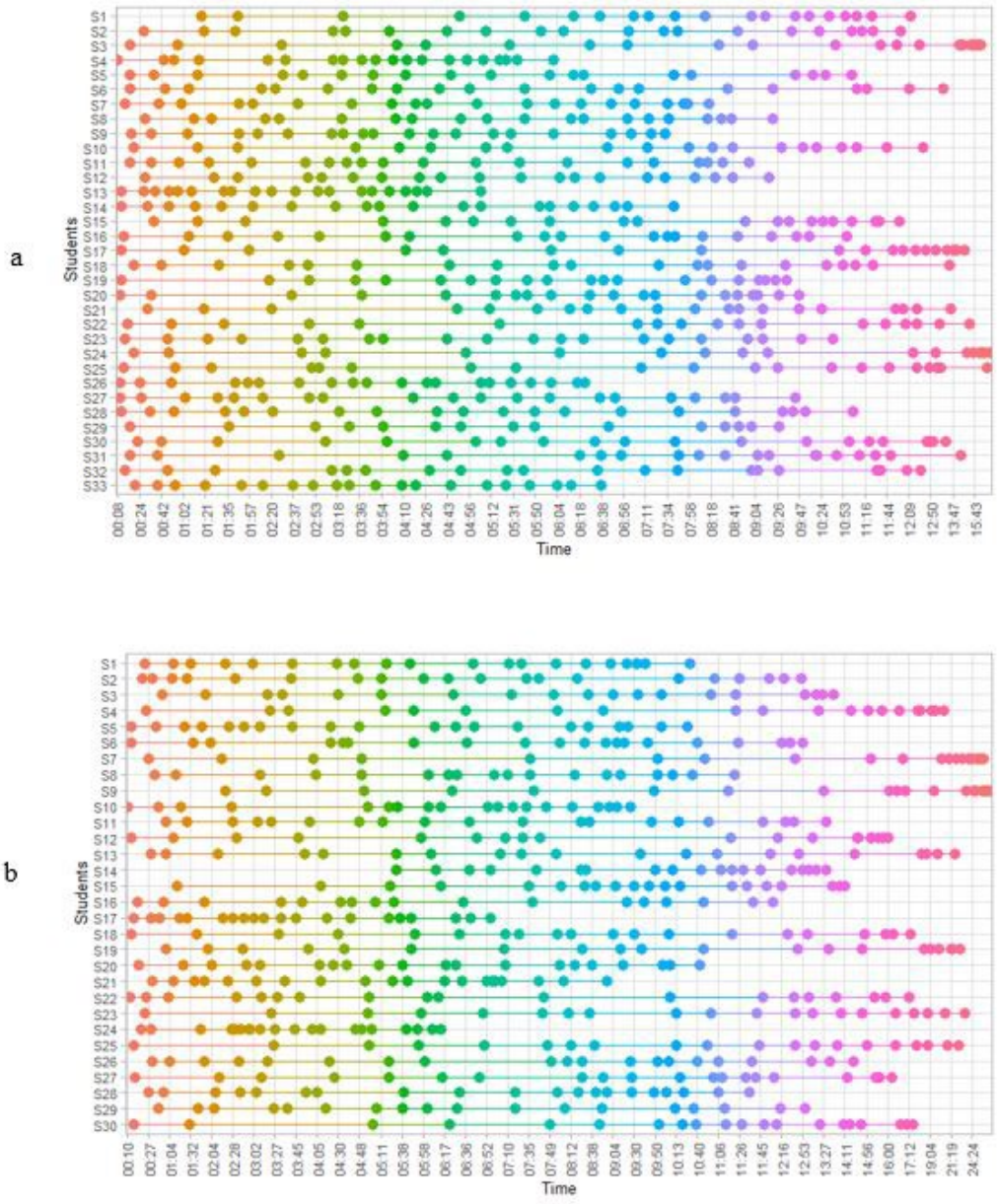
Visual Differences Between Test-Taking Behaviors in Proctored and Unproctored Exams

To understand whether there was a difference between the behavior patterns of the students in the proctored and unproctored exams, the data were visually examined. Figure 2 shows students' question transition patterns in proctored and unproctored exams. The X axis represents the time in minutes, while the Y axis represents each individual student. Each horizontal line on the graph represents the student's test-taking behavior. While the dots point to the question the students were on at that moment, the colors vary according to the time. For example, the orange color indicates the first minutes of the exam, while the pink color indicates the last minutes of the exam. Each dot points to a different question (the leftmost dot is the first question, the second question is to its right, the third question is to its right, and so on). A short

distance between two points indicates that the student made a quick transition from one question to the next—that is, they spent little time on the question. On the other hand, a long distance between two points indicates that the student spent a long time on that question. The times on the X-axis are aligned so that the two graphs are comparable. In other words, the start time of the exam was zero minutes.

Figure 2

Students' Test-Taking Behaviors in Proctored (Panel a) and Unproctored (Panel b) Exams



When the graphs were examined, it was noteworthy that the students exhibited similar behavior patterns in both exams. For example: some students completed the exam in a short time (e.g., S4, S13 in proctored

exam; S17, S24 in unproctored exam), some took longer (e.g., S17, S25 in proctored exam; S13, S19 in unproctored exam), and the frequency of question transition increased toward the end of the exam (e.g., S3, S24 in proctored exam; S7, S19 in unproctored exam). Apart from this, there were no behaviors that may have been related to cheating, such as waiting until the last minutes of the exam and answering all the questions in a short time (Noorbehbahani et al., 2022). In the unproctored exam, S24 seems to have started the exam within the first 20 seconds and finished the exam after 6 minutes. If there was a student with this pattern towards the end of the exam, we might suspect that student was cheating. For example, S14's first attempt was made in the fifth minute and the last attempt was made in the fourteenth minute. Other students started the exam on time and regularly navigated between questions.

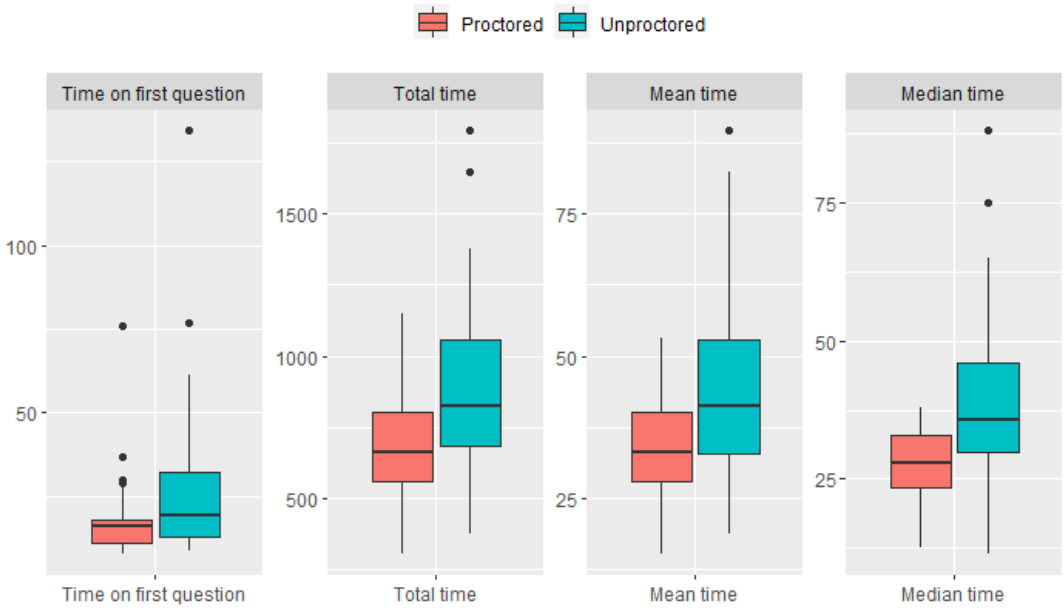
Since the question navigation in the exam was set sequentially, the students could not return to a question they had already answered. For this reason, a student exhibiting cheating behavior would have been expected to wait through the first minutes of the exam without any question transition. Or if they look up the answers to the questions from a different source, we would have expected the time spent on the questions to be longer. However, the test-taking patterns of the students who took the unproctored exam did not indicate either anomaly when compared to the students who took the proctored exam. The most important difference between the proctored and unproctored group was that while all students completed the proctored exam within 16 minutes, the unproctored exam took up to 24 minutes.

Significant Differences in Terms of Time Spent on the First Question, Total Time on the Exam, and the Mean and Median Times on Each Question

Applied pairwise comparisons answered the second research question. The Shapiro-Wilk test showed a significant departure from normality for time spent on the first question for the proctored (n = 33, W_p = .643, p = .001) and unproctored (n = 30, W_{up} = .716, p = .001) groups. In addition, the distributions of the features, such as total test time (W_p = .984, p = .904; W_{up} = .941, p < .095), mean time spent on each question (W_p = .986, p = .934; W_{up} = .940, p < .090) and median time spent on each question (W_p = .959, p = .237; W_{up} = .927, p = .040) was investigated. Considering the box plots (Figure 3) and the outliers in the features, Mann-Whitney U tests were applied to investigate whether there were significant differences between proctored and unproctored tests in terms of students' test-taking behaviors.

Figure 3

Box Plots of Behavioral Features



The Mann-Whitney U test indicated that there were significant differences between unproctored and proctored groups in terms of time metrics (Table 4). The time spent on the first question was significantly longer in the unproctored (*Mdn* = 19.50) than in the proctored exam (*Mdn* = 16.00, *U* = 343.50, *z* = -2.09, *p* = .037). The total time spent was significantly longer in the unproctored (*Mdn* = 822.50) than in the proctored exam (*Mdn* = 662.00, *U* = 278.00, *z* = -2.99, *p* = .003).

Table 4

Results of Mann-Whitney U Test Comparisons of Behavioral Features

Feature	Proctored (*n* = 33)		Unproctored (*n* = 30)		*U*	*z*	*p*
	Mean rank	Sum of ranks	Mean rank	Sum of ranks			
Time spent on the first question	27.41	904.50	37.05	1111.5	343.50	-2.09	.037
Total time spent on the exam	25.42	839.00	39.23	1177.0	278.00	-2.99	.003
Mean time spent on	25.65	846.50	38.98	1169.5	285.50	-2.88	.004

each question							
Median time spent on each question	24.89	821.50	39.82	1194.5	260.50	-3.23	.001

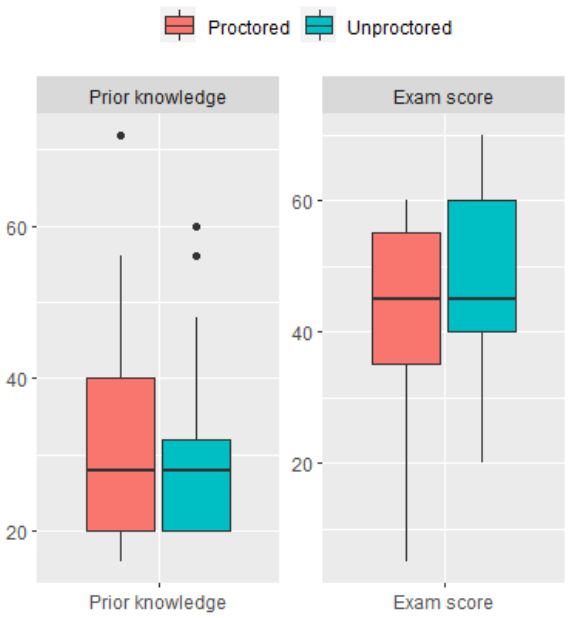
The Mann-Whitney U test also showed that the mean time spent on each question was significantly greater in the unproctored (*Mdn* = 41.13) than in the proctored exam (*Mdn* = 33.10, *U* = 285.50, *z* = -2.88, *p* = .004). Similarly, the median time spent on each question was not significantly greater in the unproctored (*Mdn* = 35.75) than the proctored exam (*Mdn* = 28.00, *U* = 260.50, *z* = -.3.23, *p* = .001).

Significant Differences in Students' Exam Scores

The test results indicated that prior knowledge in the proctored (n = 33, W_p = .877, p = .001) and unproctored (n = 30, W_{up} = .824, p = .001) groups and exam scores in the proctored (n = 33, W_p = .914, p = .012) group did not distribute normally. But the results showed evidence of normality for exam scores in the unproctored (n = 30, W_{up} = .934, p = .062) group (Figure 4). Thus, Mann-Whitney U Test has been used to comparison of proctored and unproctored groups.

Figure 4

Box Plots of Exam Scores



A Mann-Whitney U test indicated that there was no significant difference between the students in the proctored (*Mdn* = 28.00) and unproctored (*Mdn* = 28.00) groups in terms of their prior knowledge (*U* = 476.00, *z* = -.266, *p* = .790).

Table 5

Results of Mann-Whitney U Test Comparisons of Exam Scores

Feature	Proctored (n = 33)		Unproctored (n = 30)		U	z	p
	Mean rank	Sum of ranks	Mean rank	Sum of ranks			
Prior knowledge	32.58	1075.0	31.37	941.0	476.00	-.266	.790
Exam score	30.44	1004.5	33.72	1011.5	443.50	-.713	.476

According to Table 5, the Mann-Whitney U test also indicated that there was no significant difference between the students in the proctored (Mdn = 45.00) and unproctored (Mdn = 45.00) groups in terms exam scores (U = 443.50, z = -.713, p = .476).

Discussion

In studies that have reviewed and determined trends in the field, assessment is a key topic (Alin et al., 2022; Bolliger & Martin, 2021; Gurcan, et al., 2021). When comparing assessment in traditional and online learning environments, much higher scores have been obtained in online environments compared to exams conducted in face-to-face environments (Alessio et al., 2018; Daffin & Jones, 2018; Goedl & Malla, 2020). A large-scale longitudinal study conducted at a public state university in Turkey revealed this situation more clearly. In that study, the six-year grades of more than 200,000 students were analyzed, including during the pandemic period. The results of the research showed that the rate of A grades, which was between 29% and 34% in the five-year period prior to the pandemic, increased to 44% during the pandemic period. Similarly, the rate of F grades, which was between 16% and 22% in the pre-pandemic period, decreased to 13% (Analytics Hacettepe, n.d.). This suggests the existence of undesirable behaviors, such as cheating and academic dishonesty. According to the fraud triangle, there are three components to morally realizing this kind of misbehavior—perceived pressures, opportunities, and rationalizations (Becker et al., 2006; Burke & Kenneth 2018; Shbail et al., 2022). It is expected that these behaviors will be prevented by redesigning assessment processes in unproctored environments.

In the literature, it is noteworthy that academic success in unproctored exams conducted within the scope of online/e-assessment has been significantly higher than in proctored exams (Goedl & Malla, 2020). As well, if exams are unproctored, academic outcomes are not reliable in e-assessment (Coghlan et al., 2021; Harmon & Lambrinos, 2008; Snekalatha et al., 2021). Moreover, even in virtual proctored exams, cheating does not appear to be fully resolved (Alin et al., 2022). Alin et al. (2022) identified three strategies for minimizing cheating behaviors. Assessment design is at the forefront of these recommendations. This study, conducted in a course in which formative assessment design (based on the scores of four quizzes, a

peer assessment activity, and a face-to-face proctored final exam) was applied, aimed to compare the exam scores and test-taking behaviors of students according to proctored or unproctored situations. The results showed that while there was no significant difference in terms of quiz scores, a significant difference was found in time-based test-taking behaviors of proctored (control) and unproctored (experiment) groups.

The lack of difference in proctored and unproctored exam score indicates that students' behaviors in the unproctored exam did not affect their quiz scores. Nonetheless, students in the unproctored group spent significantly more time on the exam in total and on each question. This may suggest that students were attempting to cheat. However, since there was no difference in exam scores between proctored and unproctored groups, the reason for the difference in time-based test-taking behaviors may be due to factors such as the Internet speed of students' online connections. While the proctored group accessed the exam in the laboratory environment through the university network, the unproctored group accessed it from their homes, dormitories, or mobile phones. Since university students often reside in student dormitories, they are likely to have lower Internet bandwidth. This may have accounted for a difference between the request and response times of the Internet user during the change of each question screen after the exam started in the unproctored group.

The literature indicates that misbehaviors decreased during exams when the purpose of the course and the assessment process were shared clearly with the students (Oosterhof et al., 2008). Moreover, Rios and Liu (2017) focused on students' test-taking behavior, rapid guessing, and scores in formative assessment, and found no significant difference between proctored and unproctored online exams in terms of these variables. The results of the present research supported these studies (Alin et al., 2022; Oosterhof et al., 2008; Rios & Liu, 2017). If a formative assessment design is adopted in online learning, there is an exceedingly rare possibility that cheating behavior will be observed in low-risk exams. This possibility should not raise huge concerns about the fairness of the process.

Conclusions

Within a blended course designed to address limitations imposed by the COVID-19 pandemic, it is unlikely that cheating-related behaviors on exams will be frequently observed in situations where formative assessment scores affect overall performance. In this context, researchers and practitioners may reduce concerns about academic integrity in online courses by moving from a focus on summative assessment to an approach that measures every step of the process and collects evidence of learning at every stage (e.g., Alexandron et al., 2022). The results of this study will guide researchers by having (a) designed low-risk exams by analyzing exam data, (b) created insights about the issues to be considered in the security of exams, and (c) designed intervention systems to be developed in the future.

Due to the experimental design, there are two limitations to the study. First, since the experimental and control groups accessed the exam in different environments, the test-taking behavior in the experimental group may have been affected by the environment, Internet speed, and the devices through which students connected. Second, the exam settings allowed students to take questions in random order and did not allow them to return to a question they had answered. Such a setting is among the main measures to address

cheating (Chirumamilla et al., 2020). In this study, time-based metrics that were expected to differ in terms of test-taking behaviors were assessed in such exam settings (e.g., monitoring the use of time; Alin et al., 2022). The research results are not generalizable to an exam setting in which students can move freely and/or questions are not random. In future research, proctored and unproctored statuses can be compared according to different exam settings.

The test-taking behaviors of the students were compared in terms of the groups that took the exam in an unproctored and proctored environment. However, there may be students, especially in unproctored groups, who have different test-taking patterns (e.g., fast responders, late starters, fast finishers, and normal or abnormal behavior). In future research, the behaviors and exam performances of students with different test-taking patterns should be examined in depth.

This study discussed the lack of difference between proctored and unproctored situations by relating it to the assessment design. The absence of differences between groups cannot guarantee a lack of cheating in unproctored groups. In this context, there are definitions of abnormal test-taking behavior in exams (Hu et al., 2018; Tiong & Lee, 2021). Tiong and Lee (2021) labeled a situation as abnormal when the speed was too fast or too slow, and the questions were answered 90% correctly. In the present study, the metrics were time-based. Therefore, future research could separate the students who answered the questions very quickly and were highly successful (abnormal 1) and those who answered questions very slowly and had a lot of success (abnormal 2). These groups may be compared to students who behave normally, both in terms of exams and overall performance. Moreover, some outliers were observed in terms of test-taking behaviors (see Figure 3). Exactly why outliers spend much more time (e.g., time on the first question, mean time) than other students is unknown. If future research proves that outliers cheat, outlier detection may be used to determine cheating behaviors.

Declarations and Ethics Statements

The authors have no conflicts of interest to declare that are relevant to the content of this article.

The authors have approved the manuscript for submission.

All procedures performed in the current study involving human participants were in accordance with the ethical standards of the institutional research committee. A consent form was prepared and explained to the participants both while collecting log data and applying the scales. Written informed consent was also obtained from all participants prior to the research in LMS.

The datasets generated during and/or analyzed during the current study are available from the corresponding author on reasonable request.

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Collaboration and Ethics in Distance Learning Design

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Abstract

Ethical education practices require that all students have access to quality learning resources, necessary learning supports, diverse learning strategies, and deep learning opportunities. When it comes to learning strategies and opportunities, collaborative learning practices foster deep learning through socio-cultural interactions, asserting that individual learning is limited compared to what can be learned as a community. Education systems have an ethical obligation to ensure that what is advocated for in curricula can be achieved and will be supported. Although K–12 curricula are typically rooted in collaborative approaches, many asynchronous secondary online learning courses continue to be associated with individual learning approaches. This research used insights gleaned from 35 survey responses and 18 semi-structured interviews with secondary asynchronous distance learning teachers to analyze how collaborative learning is actualized and examine barriers to its implementation. Collaborative online learning opportunities were increasingly prevalent when communities outside of the school were leveraged for experiential learning and when students were paced as a cohort. The data indicated that an increase in collaborative learning was not likely to occur unless the learning ecosystem valued online learning as equitably as face-to-face learning in terms of investment in research-based pedagogy, student support, teacher support, and teaching and learning resources. Until such time, distance learning students will be disadvantaged concerning building collaborative competence that can lead to deeper learning opportunities.

Keywords: collaborative learning, asynchronous distance learning, online learning, learning ecosystem, social-constructivism

Collaboration and Ethics in Distance Learning Design

The authors argue that education systems have an ethical obligation to design and support opportunities for all students to experience deep learning. Collaborative distance learning (DL) approaches have been shown to improve deep learning, learning enjoyment, and opportunities to learn from diverse perspectives (Shearer et al., 2020; Yates et al., 2021). However, secondary school asynchronous DL has been slow to shift to collaborative approaches. This slow shift may stem from, a) a lack of understanding of possible asynchronous distance learning pedagogies, b) an assumption that asynchronous distance learning is synonymous with self-paced independent learning, or c) the small footprint distance learning had in the education system, before the COVID-19 pandemic.

This study showed that collaborative DL approaches were possible when the learning ecosystem had alignment among the learning supports, the pedagogy used, and the student's learning needs. However, when a self-paced individual pedagogy is used for all students, many students' abilities to meet the depth intended in the learning outcomes are negatively affected. The authors argue that educational institutions have an ethical obligation to meet the needs of each student and ensure a learning environment supportive of those needs.

Statement of the Problem

Collaborative approaches to learning are embedded in many K–12 curricula (e.g., collective achievement, willingness to collaborate, and communitarian thinking and dialogue) as they are understood to improve learning outcomes in comparison to what one can learn alone (Barkley et al., 2014; Vygotsky, 1978). Furthermore, Beck and Kosnik (2006) claimed that this social dimension to learning "is not just a frill added to make learning more enjoyable; it is fundamental to deep understanding" (p. 22). However, little is understood about how to support this approach in asynchronous distance learning (A-DL) where there is limited, if any, real-time communication, and where collaboration with peers may reduce a student's need to self-pace. This research is an integral first step in connecting theory to practice by exploring how collaborative learning has been actualized in secondary A-DL, what barriers exist, and how the current system might be strengthened to support collaborative learning.

Literature Review

The purpose of this literature review is to a) introduce research about collaborative pedagogies and their connection to deep learning, b) distinguish the significant differences between synchronous and asynchronous distance learning, and c) explain how viewing distance learning as a learning ecology enriches the understanding of DL pedagogy and design.

Collaborative Pedagogies and Distance Learning

Collaborative learning is an intentionally designed learning strategy to actively engage students in learning with and from others (Barkley et al., 2014; e.g., through critical discussions and debates). Collaborative learning has been directly linked to what Vygotsky (1978) coined as the zone of proximal development (ZPD). The ZPD represents the increased cognitive development the learner is capable of with the help of a

more knowledgeable other (MKO), in contrast to what they would be capable of learning unaided. The MKO could be a teacher, peer(s), or an online community (e.g., online discussion board, chat room). An expanded version of the ZPD (Billings & Walqui, 2018) has suggested that increased learning can also occur through interaction with equal peers where shared ideas can advance learning, or less capable peers, as students often learn through teaching. Additionally, working in the ZPD *can* occur when working alone, where students have learned to independently monitor their learning through using "inner speech, resources in their environment, and experimentation" (Walqui & van Lier, 2010, p. 31).

Within DL, collaborative practices have been shown to strengthen deep learning (Mehall, 2020; Wu et al., 2022). For example, a comparative qualitative study by Barbour and Rich (2007) found that distance-learning student performance on an advanced placement history exam was noticeably better when students learned through collaborative learning tasks compared to traditional teacher-led drill and practice. A further qualitative study by Offir et al. (2008) compared interactions in asynchronous versus synchronous distance learning approaches and found that student achievement improved as social interactions increased. In both studies, students showed deeper learning (e.g., transferability of information and connection to existing experiences) through collaborative learning.

McMullen and Rohrbach (2003) cited the negative effects of not using a collaborative approach, particularly for Indigenous students across Canada, who have not been well served by distance learning, historically. They noted that "by imposing or expecting too much independence on a group of people who believe in relationships and social learning, the curriculum developer and instructor will restrict the positive influence of the culture, and ultimately the success of the course" (pp. 69–70).

Distinctions Between Synchronous and Asynchronous Distance Learning

The most notable difference between asynchronous and synchronous distance learning is in how and when students communicate. In synchronous DL the instructor and class meet online together at the same time, typically through a video chat (e.g., Zoom). Strengths of synchronous DL include the ability for learners to gain immediate feedback and interact with their peers in real-time, which can increase their motivation and reduce feelings of isolation (Gunes, 2019). Limitations of synchronous DL include Internet bandwidth issues and reduced scheduling flexibility.

In contrast, communication in asynchronous DL primarily takes place through text-based communication (e.g., discussion boards) at a time and place of the student's choosing. The benefits of asynchronous DL include increased scheduling flexibility, the opportunity for continuous lesson review (Ghilay, 2022), and increased student processing and response time, eliciting deeper responses compared to synchronous chats (Brierton et al., 2016). However, Murphy and Rodríguez-Manzanares (2008) suggested that asynchronous DL may be problematic for many high school students who are not ready for the independence required in this learning environment.

Research in collaborative asynchronous DL has often focused on text-based communication (e.g., discussion boards; Garrison et al., 1999). However, we interpret that collaborative learning is larger than discussion boards alone and education systems must look for ways to support collaborative learning beyond discussion boards.

Viewing Distance Learning as a Learning Ecosystem

In this research, collaborative learning was situated within a learning ecosystem (Biem, 2022) conceptual framework. Educators have adopted the term learning ecosystem as a working model to understand the interactive and complex processes that support distance learning (Hecht & Crowley, 2020; Jackson, 2013; Lemke, 2000; Nardi & O'Day, 1999). A distance learning ecosystem depends on, and is supported by, a network of relationships between people (e.g., policymakers, peers, parents, teachers, Internet connectivity) which are affected by environmental factors such as policy, cultural norms, and resources. However, Hecht and Crowley (2020) argued, and we agree, that "an exclusive focus on individuals, or even groups of individuals, fail to recognize and account for larger cultural practices that co-evolve with and co-create learning and development" (p. 10). Without this understanding, distance learning policymakers, administrators, and teachers may struggle to identify where and how to focus resources to support deep learning in asynchronous contexts.

Education systems (e.g., policies, procedures, pedagogy) have an ethical obligation to adapt to the needs of students in a constantly evolving local or regional learning ecosystem. This requires intentionally building and supporting a network of relationships including, but not limited to, the teacher. Consider for example, teacher-centered learning ecosystems with a strong reliance on the teacher to deliver content and facilitate learning. COVID-19 disrupted teacher-directed learning leaving many students unable to lead their learning in the absence of a teacher telling them what to do (Yates et al., 2021). The learning ecosystem concept aids in understanding a connected and interactive distance learning system to analyze how and why collaborative asynchronous distance learning approaches succeed or fail.

Methodology

This study used a mixed methods sequential design in two distinct phases: quantitative, followed by qualitative (Creswell & Plano Clark, 2018; Schoonenboom & Johnson, 2017). In the first phase, a quantitative online survey was used to gain a contextual descriptive analysis of the general target population and recruit participants for the qualitative phase. During the second phase, in-depth semi-structured interviews were completed with participants who self-selected from the online survey in phase one. The survey preceded and then complemented the semi-structured interviews, providing a descriptive analysis of teachers' experiences, and providing information in response to what questions (e.g., What strategies? What barriers?). The semi-structured interviews allowed for an in-depth investigation to move beyond what teachers do, to show how and why teachers implement specific DL approaches and make the design choices they do. Although both quantitative and qualitative methods were used, the core theoretical drive was qualitative. The quantitative and qualitative data were analyzed separately, then the quantitative findings were merged into the discussion stage of the qualitative research.

Participants

Participants were limited to secondary school asynchronous distance learning teachers within the Western Canadian province of Saskatchewan. Eight out of fifteen school divisions with a DL program consented to participate. There were 35 survey participants from these divisions across the province. Survey respondents

included 19 males, 15 females, and 1 other participant. Participants' years of experience teaching distance learning ranged from less than 2 years to 16-plus years. All core subject areas (i.e., English, mathematics, science, social science), as well as practical and applied arts, visual arts, physical education, and English as an additional language, were represented within the participants' teaching experiences. A total of 20 survey participants indicated a willingness to follow up with an interview. Of those, 18 followed through with the interview.

Setting

The location of Saskatchewan was chosen as it was the researchers' home province and the K–12 curriculum there was rooted in collaborative teaching and learning practices (Saskatchewan Ministry of Education, 2010). The province's provincially funded education system included 27 school divisions (18 public school divisions, 8 separate Roman Catholic school divisions, 1 separate Protestant school division, and 1 francophone school division). At the time of the study, the province had 186,036 K–12 students enrolled in the provincially funded school system (State of the Nation, 2022). There were 780 K-12 schools, including 59 small schools of necessity (schools that are at least 40 km away from the nearest similar school and have an average of 14 students per grade) and 20 urban centres (centres with populations greater than 5,000) with approximately 43% of the schools (335) within the urban centres (Saskatchewan Ministry of Education, 2021). Sixteen percent of the population self-identified as Indigenous (Statistics Canada, 2017), and, as of 2016, there was an 18.6% Indigenous student population in K–12 provincial schools and 22.6% in all Saskatchewan schools, private or on reserve (Saskatchewan Ministry of Education, 2018).

According to State of the Nation (2022), in 2020, exclusively online schools in the province included "16 provincial schools in 13 school divisions, one independent school, and one First Nation educational authority. During the 2019–20 school year, there were 13,666 course enrolments involving 8,138 unique students in Grades 10 to 12" (para. 4).

Data Collection

Data was collected from an online survey *(N* = 35) that took approximately 15 minutes to complete, and semi-structured interviews (*N* = 18) lasting approximately one hour. The survey was divided into two parts, the first part included closed-ended questions clarifying the participant's context (e.g., years of teaching, subjects taught, course pacing). Part two asked questions related to participants' beliefs and understandings about collaborative approaches, barriers, and supports necessary for collaborative practices to be successful. The survey consisted mainly of closed-form questions (e.g., Likert scale and checklist items) from which a description of the sample population's contexts, beliefs, and practices was created.

Analysis of Survey Descriptive Data

The survey analysis used descriptive statistics to describe the participants' *(N* = 35) context, practices, and philosophies. It also identified contributors and barriers to successful high school asynchronous DL. Descriptive statistics included frequency distribution, percentages, and basic graphic analysis (e.g., bar graphs, pie charts). The descriptive analysis from the survey was used to enhance the exploration of secondary school asynchronous DL teachers' experiences and, where appropriate, to investigate responses further during the semi-structured interview. The open-ended responses from the survey were included later in the thematic analysis with the interview data.

Thematic Data Analysis for Interviews and Open-Ended Survey Responses

Reflexive thematic data analysis was used as "a method for identifying, analyzing, and reporting patterns (themes) within data" (Braun & Clarke, 2006, p. 79). Reflexive thematic analysis "emphasizes the importance of the researcher's subjectivity as an analytic resource, and their reflexive engagement with theory, data and interpretation" (Braun & Clarke, 2020, p. 330). Deductive analysis was used to explore patterns through the lens of collaborative learning and learning ecosystems. Throughout the analysis, both theoretical coding (e.g., exploring patterns within collaborative approaches) and emergent coding (e.g., codes drawn from the data; Braun & Clarke, 2020) were used.

Braun and Clarke's (2020) six-phase analysis of the data was followed, including "1) data familiarization and writing familiarization notes; 2) systematic data coding; 3) generating initial themes from coded and collated data; 4) developing and reviewing themes; 5) refining, defining and naming themes; and 6) writing the report" (p. 331).

Trustworthiness

Trustworthiness was addressed through two separate member checks with participants from the semi-structured interviews to ensure the results reflected the participants' voices. One member check occurred after the interviews were transcribed, and another after the themes and findings were completed. To further strengthen the participants' voices and minimize the effects of the researcher's preconceived ideas, extensive participant quotes across data sets were used to support the findings. Additionally, a clear audit trail (Merriam, 2009) was maintained whereby interview transcription and data coding were transparent. The researcher's experiences and standpoint were shared with the participants and within the research design (e.g., creating memos, immersion in data). The methods that guided the study are expanded in the Findings and Discussion section of this article.

Limitations

Limitations to the sampling method included limited transferability as all research participants were recruited from the same province. Additionally, since participants volunteered to take part in the study, it is possible that not all perspectives were represented in the data (e.g., only one teacher spoke about Indigenous perspectives). No data was collected regarding the geographical location of the participants (i.e., urban versus rural, northern versus southern communities, teachers working full time online versus teachers who also teach face-to-face) or cultural context (e.g., Indigenous and non-Indigenous communities). As such, comparisons could not be made regarding varied approaches depending on context. A further limitation included a lack of responses to the second member check, where only one participant responded. It was indeterminable whether the lack of response was due to teachers' busy schedules, participation fatigue, or other barriers.

Findings and Discussion

The survey and interview findings are presented and discussed below.

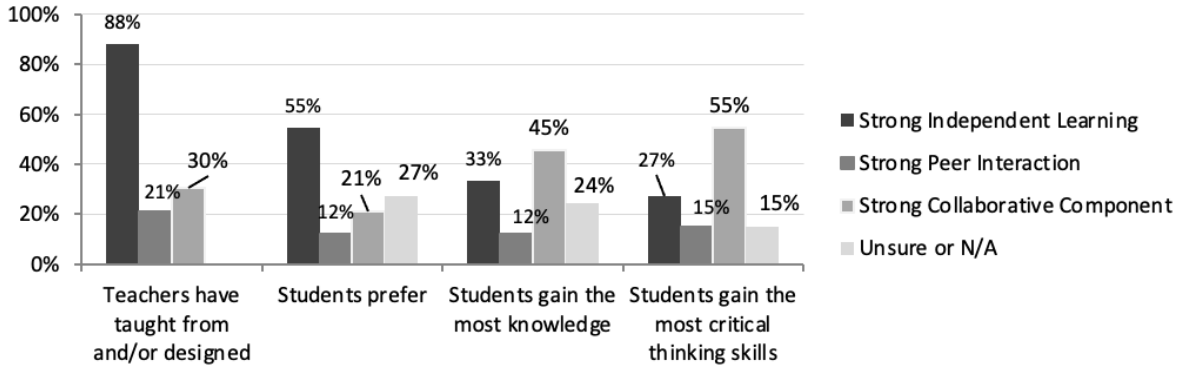
Survey Findings

Within the survey, teachers were asked to respond to questions regarding their experiences and beliefs about student interaction (Figures 1 and 2). Strong individual learning referred to contexts where the student primarily interacts independently with the concepts but gains feedback from the teacher when assignments are submitted and can ask for help as needed. A course/unit with strong peer interaction referred to interaction with course peers (e.g., discussion boards). A course/unit with a strong collaborative component (e.g., learning with and from others) referred to collaboration with peers, teachers, parents, community, and so on.

Figure 1 presents teacher responses about their experiences and beliefs about the types of interaction in online learning.

Figure 1

Types of Interaction

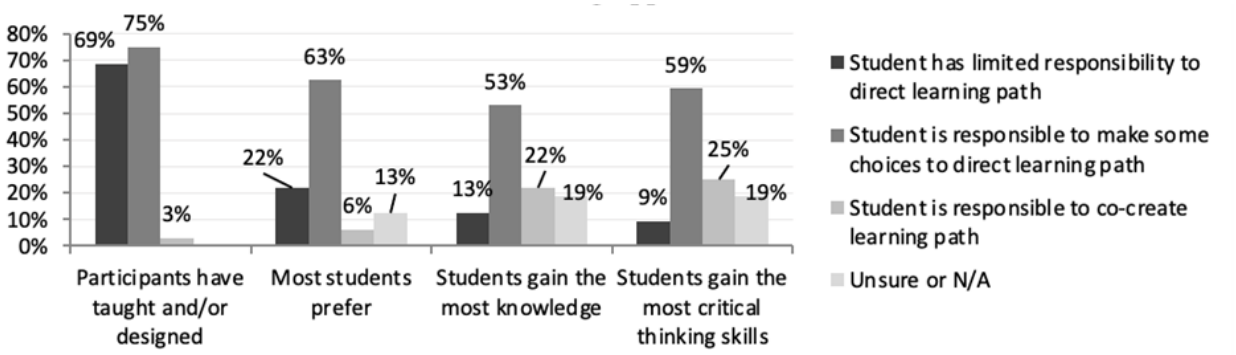


The survey indicated that most teachers (88%) have taught and/or designed courses with strong independent learning and that most students prefer this approach (55%). However, many teachers indicated that a strong collaborative component allowed the students to gain the most knowledge (45%) and critical thinking skills (55%). The survey data suggested a disconnect between value and practice, as many teachers found value in collaborative learning while still choosing independent learning approaches for distance learning.

Figure 2 represents teacher responses about their experiences and beliefs about distance learning approaches.

Figure 2

Learning Approach Assessment



Most teachers (75%) have taught and/or designed courses where the student is responsible to make some choices to direct their learning path. This approach aligned with teachers' beliefs about the best approach for student preference (55%), increased knowledge (53%), and gaining critical thinking skills (59%). Sixty-eight percent of teachers have designed and taught courses where students have a limited ability to direct their learning path, which was identified as a low preference for students (29%), and rated as the lowest for gaining knowledge (13%) and critical thinking skills (9%). Overall, the responses indicated that teacher beliefs are better aligned with their approach (providing some choice), while courses may still exist where students have minimal responsibility to make choices in directing their learning path, even though participants recognized that other approaches were better for attaining knowledge and critical thinking skills.

Table 1 summarizes teachers' beliefs about collaborative learning in DL contexts.

Table 1

Beliefs About Collaborative Learning

Belief	Agree	Somewhat agree	Neutral	Somewhat disagree	Disagree
Online high school students need to collaborate with others to gain a deep understanding	15%	39%	30%	3%	12%
Collaborative online instructional strategies increase deep understanding compared to independent online learning	21%	36%	27%	9%	6%

High school students have the necessary skills to successfully collaborate with others online	6%	24%	21%	36%	12%
Heavy reliance on collaborative learning in asynchronous online courses is a realistic goal	0%	12%	15%	30%	42%
Most students are capable of being successful in distance learning when primarily working from home	15%	45%	21%	12%	6%

Fifty-four percent of teachers agreed or somewhat agreed that high school students need to collaborate with others to gain deep understanding compared to only 15% who disagreed or somewhat disagreed with this statement. The high percentage of teachers who were neutral (30%) suggests a possible lack of experience with both approaches to make an informed decision.

Fifty-seven percent of teachers indicated that collaborative online instructional strategies increase deep understanding compared to independent online learning. However, 49% of teachers indicated that high school students do not have the necessary skills to successfully collaborate with others online, suggesting that without appropriate skills, collaborative learning is limited. Additionally, 73% of teachers disagreed or somewhat disagreed that heavily relying on collaborative learning in asynchronous online courses is a realistic goal, suggesting there is more than just a lack of student skill that inhibits collaborative learning.

Key findings from the survey results indicated that 55% of teachers believed collaborative learning is needed for deep understanding. Yet 73% of teachers indicated it is not a realistic goal in distance learning. This finding suggested that students' ability to gain the benefits from collaborative learning (e.g., deep learning and the opportunity to learn from diverse perspectives) may be limited in asynchronous distance learning. The semi-structured interviews explored why there might be a disconnect between teachers' beliefs about best practices for student learning and strategies used for asynchronous distance learning.

Semi-Structured Interview and Open-Ended Survey Response Findings

The data showed that teachers often had differing perspectives on the best instructional approaches to distance learning. Some teachers advocated for self-paced independent approaches, indicating it was a privilege to work in such environments to meet student needs. The same confidence was expressed by other teachers who spoke of the privilege they had in being able to support some synchronous communication with students. However, when a homogeneous approach was used for all students, there was often a disconnect for students who could not conform to that approach. For example, independent learning approaches worked well for some students but were problematic for students who needed more support and personal connections. The theme of alignment of student, pedagogy, and support was constructed from the data to elucidate why there was a disconnect between teachers' beliefs about the value of collaborative learning and their practices.

Alignment Among Purpose, Pedagogy, and Person

Diversity in the purposes of online schools, the pedagogies used, and individual student needs are described below. Then, distance learning systems which demonstrated an alignment or a disconnect among the school purpose, pedagogy, and student needs are examined. Finally, implications and contributing factors to disconnected systems are analyzed.

Purpose

Teachers' descriptions of the purpose of their online schools varied. Purposes included meeting the needs of:

- rural students who have limited course offerings in their face-to-face schools
- students who need student-led pacing (e.g., students who have additional family responsibilities or unpredictable schedules)
- students who need a credit recovery option
- homeschool students
- most recently, to meet the physical distancing requirements from the COVID-19 pandemic

The school's purpose often dictated the pedagogy used for all students enrolled. For example, in some divisions distance learning was never designed to be a viable option for every student. As one teacher explained, "this is for that kid—that hockey kid that comes home after hockey practice . . . he was supplementing his education with whatever subjects he's missing out on face-to-face." For others, online programming was designed to provide equitable learning options for students in remote rural schools. These students completed their online courses within the face-to-face school during the regular school day where they had some access to in-person support if needed.

Pedagogy

Pedagogy was largely dictated by the school's purpose. Pedagogies used included the following:

- Individual and independent approaches. "We built it with the idea that it was a standalone. . . . This is not for everybody. So, we just want to make [the student] aware, you're doing this on your own." (Crystal).
- Collaborative approaches. "We want to have kids talk to each other . . . in our division we value that personal connection" (Levi).
- Flexible and shifting approaches to meet the needs of the student, where the units shift between synchronous and asynchronous depending on the needs and abilities of the students. For example, one school aimed to "maximize the synchronous interaction and make the asynchronous part as relevant as possible. . . . if there's no synchronous group, you try to make sure you have those routine check-ins where each student can do a virtual side-by-side [with the teacher]" (Brian).

Interestingly, this study revealed that teachers from newer online programs (existing for five years or less) largely resisted self-paced independent online practices and advocated for collaboration and social learning opportunities. Below is a teacher's response highlighting the importance of collaboration, suggesting that asynchronous learning is associated with a lack of discussion and interaction.

> If [online learning] remains past COVID, we don't want to just be a purely asynchronous model. . . . We need to really look at this and make a new way, where I can do group discussions with my students, I can get them to interact with each other and work live with each other in a shared digital space. . . . I need to assess [those skills] . . . it's part of the social connection they need. (Emily)

Participants noted that using legacy practices stemming from paper correspondence courses was not sufficient to meet the collaborative approaches outlined in the curriculum. "If [the province] would like [DL] to be in alignment with . . . the goals of the curriculum, then we can't be going to the model of almost the old correspondence school model [self-paced and independent]" (John).

Furthermore, in every case when a self-paced asynchronous approach was needed to meet some students' needs it was used for all students, even if diverse approaches would better serve other students. A participant, Amy, described one such situation. "I got told there was two, maybe three students, that wanted to go back to their home school" and the students needed to complete the course before the end of the semester. As a result, she switched to a self-paced independent course for every student. The self-paced independent approach was problematic for her as many students were not able to self-regulate their learning: "I still have kids that haven't started" (Amy). Again, an ethical dilemma was created here by designing a course that was not intended to meet the needs of all learners. The practice of catering to students who needed self-pacing, rather than considering diverse student needs, in particular those who needed more structure, was pervasive throughout the data. However, understandably, teaching the same course with two different pedagogies may also be problematic and time consuming, in turn contributing to the use of a self-paced individual pedagogy for all (Toshalis & Nakkula, 2012).

Person (The Student)

There were diverse reasons students were enrolled in distance learning over face-to-face learning. Some students chose distance learning over face-to-face, whereas others *were required* to take distance learning. The reasons why students enrolled in distance learning included:

- anxiety from face-to-face programming
- limited course offerings in face-to-face school
- limited academic success in face-to-face schools
- unforeseen circumstances such as hospitalization
- physical restrictions due to the COVID-19 pandemic
- family choice to learn from home

Given that students' reasons for taking distance learning courses were diverse, it follows that diverse approaches are also needed.

Alignment or Disconnect

So far, online school purposes, pedagogies, and students have been discussed. Next, teachers' experiences when these three categories align or are misaligned are examined. Teachers spoke positively about distance learning education and teaching experiences when the pedagogy matched the needs of the student; they expressed teacher and student frustration when they were disconnected.

Aligned Scenarios

Teachers' descriptions of positive teaching and learning experiences were interpreted as those where the purpose and pedagogy aligned with the student's needs. The following scenarios (Figures 3 to 5) describe such situations.

Figure 3

Aligned Environment 1

School Purpose		Pedagogy Used		Student Need
Meet the needs of students who need control over course pacing and are independent	⇒	Independent self-paced	⇒	Seamless transition back to face-to-face learning when there are extended absences

Crystal illustrated this alignment when she described that "asynchronous . . . continuous intake is a huge advantage" for situations where students are absent for extended periods of time. Crystal provided an example below.

> There's a large immigration population in our city. And so, when a kid goes back to their home country for say about six weeks, it's a nightmare for their homeroom teacher. [We can] help supplement. . . . Their home school says, "Johnny's going to be missing module three with us." So, what they do is, they parachute him in [to complete the third module with us].

Figure 4

Aligned Environment 2

School Purpose		Pedagogy Used		Student Need
Student learning from home because of pandemic restrictions	⇒	Collaborative cohort paced	⇒	Connection with peers and sense of belonging in the environment Supportive environment to learn DL skills

A participant, Amy, illustrated this alignment when she described using some synchronous meetings to support students who may struggle with self-regulating their learning.

> [The class will] meet as a whole group on Mondays and Fridays, and that's just for me to see who's showing up . . . who seems to be engaged. . . . Then Tuesday-Wednesday-Thursday, I'm usually reaching out to kids I know are not doing anything, or if they've asked a question and we try to do these small group meetings for whoever needs it.

Note that Amy used a cohort-paced model, supportive of students' needs, and created flexibility to incorporate some synchronous sessions, while still allowing much asynchronous learning freedom within the week.

Figure 5

Aligned Environment 3

School Purpose		Pedagogy Used		Student Need
Meet the needs of homeschooled students	⇒	Experiential learning	⇒	Connection to community and family context

Another example of a connected environment was described when the primary purpose of the course was to meet the needs of homeschooled students (pre-COVID-19). Teachers used an experiential learning approach that focused efforts on field trips, volunteerism, or work placement. In this context, teachers actively looked to create opportunities for peer interactions to give students as normal a high school experience as possible. A participant, Ruth, shared her experiences in such an environment. "[We organize] events for our students and then incorporate that into the curriculum. . . . I organized an outdoor . . . winter camping trip and it was fantastic. . . . Those opportunities . . . are similar to our community of students feeling connected with other people in their [face-to-face] school."

In the case described by Ruth, cohort pacing was not needed for collaborative learning, but students had to prioritize attendance at the field trips (noting they were optional).

In each case above, the purpose, pedagogy, and person aligned, and teachers spoke positively about how distance learning met students' needs.

Disconnected Scenarios

Teachers who discussed situations that did not lead to student success (e.g., lack of course completion or meeting curricula outcomes) cited notable disconnect with the purpose, pedagogy, or person. The following scenarios (Figures 6 to 8) describe such situations.

Figure 6

Disconnected Environment 1

School Purpose		Pedagogy Used		Student Need
Meet the needs of students who need additional course credits without learning challenges	⇒	Independent self-paced	⇏	Students enrolled need significant academic and or readiness support

Many teachers described an increase in enrollment of students experiencing significant learning challenges and/or attendance concerns, without the equitable support students would receive in face-to-face classrooms. One teacher, Jane, suggested that face-to-face schools that enrolled students in DL "thought that this was just a dumping ground" for students who had issues with face-to-face attendance or in-class behavior. She went on to say that tracking those students was stressful, especially when students inaccurately communicated to their parents that they were working.

Figure 7

Disconnected Environment 2

School Purpose		Pedagogy Used		Student Need
Meet the needs of diverse students (e.g., students who need independent learning and other students who need personal connection)	⇒ ⇏	Independent self-paced	⇒* ⇏	Student needs a social connection for motivation and interest. Student needs DL self-regulation support

**Note.* There was a need for two separate approaches, yet only one pedagogical approach is used, leading to a disconnect for some students.

Another example of a disconnect in the environment was cited when an independent self-paced pedagogy was used for all students when a collaborative approach would be better suited for *some* students. In the example below, one participant, Tom, highlighted the school norm where students would engage in so-called binge work at the end of a term, impacting the teaching and learning cycle needed for deeper learning. "Students [have] the option of procrastinating and then hammering out a course in 3 weeks. . . . You just don't have the option then to even give the kids feedback for meaningful learning" (Tom).

A teacher in a different situation (e.g., where the student was independent) might view self-paced independent learning as an advantage (e.g., they can finish a course quicker and at their own pace). However, here, where a student cannot, or does not, self-regulate, procrastination can affect the teaching and learning cycle creating a mismatch between the pedagogy, or support associated with the pedagogy (e.g., time management support; Anderson & Dron, 2012), and the student's learning needs. Simply put, a homogeneous pedagogy is problematic in providing support for students' unique needs.

Figure 8

Disconnected Environment 3

School Purpose		Pedagogy Used		Student Need
Meet the needs of rural students needing additional credits	⇒	Cohort paced collaborative	⇏	Flexible learning schedule due to unpredictable family responsibilities

Figure 8 illustrates a learning environment where a student needs self-paced learning due to extenuating circumstances (e.g., family responsibilities, mental health, addictions) but the course is paced as a collaborative cohort. For example, course expectations will be unattainable for students who cannot commit to collaborative work where their peers are relying on them to complete a collaborative project.

Note, this situation does not describe environments where students advocate for an individual approach to avoid collaborative work. In that case, student resistance should be viewed as an opportunity to "coach" the student and challenge them to grow intellectually through collaborative learning, even though, at first, it might seem hard (Driscoll, 2005).

Additional Factors Contributing to Disconnect

Without a plan in place for students who need significant support for distance learning readiness (e.g., technology skills, self-regulation), collaborative learning was not realistic for teachers given the additional time needed to support students. Teachers often noted that senior administration staff did not sufficiently understand distance learning. The implication here was that distance learning environments needed to be intentionally designed and supported for all students enrolled. For example, John's statement below implied that collaborative approaches are largely influenced by the environment (e.g., teacher workload).

> The desire of every teacher at heart would love to be doing problem-based learning and collaboration and deep learning. All of us would love that . . . but the current workload that at least I am experiencing. . . . It would not be possible. It's just too much.

Summary

A lack of clarity regarding the diverse approaches to distance learning has been problematic. Distance learning is not a one-size-fits-all approach. Although self-pacing is not synonymous with asynchronous learning, unrestricted self-pacing with little collaboration seems to be an unchallenged norm in many secondary asynchronous courses. Some students need an unrestricted self-paced option to graduate from high school (e.g., family responsibilities, extra-curricular obligations, medical reasons), but many students do not.

Pacing considerations for an asynchronous cohort model were an overlooked, yet more supportive, model for collaborative practices. Pedagogy was largely determined at the administrative level. However, where teachers paced students as a cohort, they cited an increase in opportunity for social constructivist practices with peers, more time supporting critical discussions, and fewer inactive students. The results suggest that the so-called free-for-all of student-led pacing is insufficient for peer-to-peer collaborative engagement and, at times, is a barrier to deep learning (e.g., procrastination disrupting the feedback-learning cycle). Further research is needed to examine the differences between self-paced and cohort-paced asynchronous courses.

As previously stated, not all online programs were designed to meet all students' needs. Designing a school to meet a niche student's needs is not problematic in itself. It is problematic, and, we argue, is an ethical dilemma, when all students are allowed to enroll in a program knowing the necessary support cannot or will not be included to set students up for success. Enrolling a student in a course without incorporating the known essential learning supports creates an ethical dilemma by inadequately supporting students' academic success and well-being. This lack of support and alignment of the pedagogy to students' needs suggests one reason that DL might be interpreted as a dumping ground.

For most schools, the findings suggested the online student has shifted from a niche student (e.g., independent students who needed control of place or pace of learning), to a more diverse population (e.g., students supplementing face-to-face courses, homeschooled students, students who are not comfortable in a face-to-face classroom). The shift in student populations for online schools has not always equated to a shift in the pedagogical approach or student services support. Student-led learning with little to no collaborative learning appeared to be the default pedagogy.

Conclusion

The findings show that collaborative approaches in asynchronous DL are possible through leveraging communities for experiential learning and, where possible, using a cohort-paced course design. Using the

same approach for all students does not meet the education system's ethical obligation to meet the unique needs of all students.

Although not all teachers expressed the sentiment that distance learning was sometimes used as a so-called dumping ground, a lack of student support systems was often cited. Furthermore, the use of this term should be cause for alarm, elevating the necessity of education systems to re-evaluate their ethical obligation to provide learning support for all DL students, including those with attendance or behavior challenges and those who need to build online learning skills (e.g., time management).

This research indicates that in many cases, prior to COVID-19, online learning was a niche learning ecosystem designed for students in unique circumstances. The findings suggest that the current disconnect between the value online teachers place on collaborative learning with their practice lies largely within the design of the learning environment that was never intended to support this type of learning. A lack of student support, a default to self-paced individual learning, and a lack of modelling of this learning approach often created a learning environment that defaulted to independent self-paced learning. Since the design of the learning environment dictates what type of learning can occur, it follows that without an alignment among the student's needs, the pedagogy used, and the supports provided, collaborative online learning ecosystems are not likely to be prevalent in asynchronous distance learning environments.

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Development and Validation of the Sense of Online Community Scale

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Abstract

This study focused on the development and validation of the Sense of Online Community Scale (SOCS), which includes 28 Likert-type scale items across six subscales: (a) program community, (b) program academic activities, (c) program social activities, (d) institutional academic activities, (e) institutional social activities, and (f) affiliation. The validation process included an implementation with 293 learners enrolled in online programs at a higher education institution in the eastern United States. The model was evaluated with and without outliers, and results show that the model aligned well with the SOCS. The means of all items except one exceeded 3.5 on a 5.0 scale, ranging from 1 (strongly disagree) to 5 (strongly agree). Time in an online program was not a statistically significant predictor of the validation model, though most of our participants were in the first or second year of their degree programs. Findings demonstrate that the SOCS is a reliable and valid instrument that other researchers may use to investigate community in online environments on both the program and the institutional level.

Keywords: online community, online students, online learning, confirmatory factor analysis, higher education

Development and Validation of the Sense of Online Community Scale

As higher education institutions increasingly turn to online delivery to increase student numbers, expand access to university programs, and meet the interests of learners who have become more amenable to distance education since the COVID-19 pandemic, they also seek solutions to combat feelings of isolation among students and faculty, increase retention, and better prepare learners for career advancement and promotion. One common approach is the establishment of a sense of community. *Community* has been defined as a sense of membership, belonging, and trust (Glazer et al., 2013; McMillan & Chavis, 1986; Rovai, 2001). As faculty and students interact and collaborate with each other over time, relationships strengthen, mutual goals form, and all parties benefit (Jason et al., 2015; Jiang, 2016; Wenger et al., 2002).

However, most community research focuses on implementations within courses (Palloff & Pratt, 2007; Rockinson-Szapkiw & Wendt, 2015; Shepherd & Bolliger, 2023a). This focus is problematic because courses may lack the duration required for sustained community development (Bellah et al., 1985; Liu et al., 2007; Smith et al., 2017); course-based communities place additional responsibility on instructors for their implementation and maintenance (Shepherd & Bolliger, 2019); and a focus on course practices ignores the larger program, institutional, and professional endeavors that influence retention and success of students and faculty members (Lee & Choi, 2011; Milman et al., 2015; Shepherd & Bolliger, 2023a; Tinto, 1999, 2012). Based on these concerns, researchers are beginning to broaden community foci (Bolliger et al., 2019; Glazer et al., 2013; Jason et al., 2015; Shepherd & Bolliger, 2019). Indeed, Shepherd and Bolliger (2022) defined *community* as "a feeling of belonging, affiliation, purpose, and interdependence that exists among instructors, support staff, students, alumni, and program, college, or university friends as they collaborate and progress on shared learning goals and activities over time" (p. 2). Although online programs are beginning to consider community development from both micro and macro perspectives, little research indicates what events and activities promote a sense of community among learners. The purpose of this study was to develop and validate an instrument to help higher education institutions determine what academic and social events influence perception of community formation.

Literature Review

Although most research focuses on course-based communities in online degree programs (O' Shea et al., 2015; Rockinson-Szapkiw & Wendt, 2015; Speiser et al., 2022), the concept of extending community to other settings is not new. Prior to online learning, researchers discussed the need to extend community concepts beyond proximate, physical spaces to consider disbursed relationships (McMillan & Chavis, 1986; Wellman, 1979). These concepts heralded views of community in online settings (Rovai, 2001) and pointed to broader foci of community establishment. Hill (1996) indicated that communities look and function differently in classrooms and programs. Wenger et al. (2002) stated that community members are often associated with myriad communities, some accounting for larger social perspectives. In higher education settings, some researchers highlight the individual, the course, and the institution as separate community layers (Bolliger et al., 2019; Glazer et al, 2013; Palloff & Pratt, 2007; Shepherd & Bolliger, 2019). Jason et al. (2015) referred to these layers as micro and macro elements of community. In these instances, a sense of community was associated with individual, instructor, and institutional factors. Shepherd and Bolliger

(2023a) further included a professional dimension that begins within programs but extends beyond degree attainment. The following sections describe these layers.

Levels of Community

Institutional Community

Higher education institutions exert time and energy to make their campuses welcoming and inviting. Physical buildings and manicured grounds provide a sense of prestige (Nathan, 2005). Recreation facilities, updated housing, museums, and other amenities attract students. Yet, community often begins prior to entering a campus. Decades of academic tradition, collegiate sports, university colors, mascots, and logos brand institutions of higher education (Dennis et al., 2016). These resources provide a sense of affiliation and shared interest among individuals on and off campus. Indeed, many aspects of higher education promote community. Admission requirements formalize membership and instill a sense of belonging (Shepherd & Bolliger, 2023a; Tinto, 1999). Administrative policies and procedures articulate shared governance among students, faculty members, and professionals while encouraging continued and sustained interaction to promote learning among groups with similar interests and goals (Smith et al., 2017; Tinto, 2012; Wenger et al., 2002). These interactions over time foster trust, a sense of belonging and value, and interdependence, and they add to the shared history that influences the institution's reputation and brand (Dennis et al., 2016). The role of the institution for online students follows a similar trajectory. Although physical grounds and buildings may be less proximate, student ties to a physical, storied location influence a sense of membership. Indeed, most online students live within an hour of campus (Seaman et al., 2018; Shepherd & Bolliger, 2023b; Xu & Jaggars, 2013) and are aware of its physical and social presence in the surrounding community. Existing policies and procedures also provide a guide for community entrance, interaction, and goal attainment among online students (Shepherd & Bolliger, 2023a; Wenger et al., 2002).

Institutions play a large role in helping students enter and feel that they belong in learning communities (Lee & Choi, 2011; Tinto, 1999). Academic and social programs help students enter and maintain success in the community. Academic supports such as writing centers, libraries, and career and counseling centers provide needed services for diverse students (Kang & Pak, 2023; Milman et al., 2015; Trespalacios et al., 2023). So, too, do the myriad student groups, clubs, and activities that help students locate others with similar interests and aid the transition to university life (Exter et al., 2009; Nathan, 2005; Shepherd & Bolliger, 2019; Tinto, 1999). These resources promote a sense of belonging and safety. They also promote trust that individual goals will be attainable at the institution.

Program Community

One focus of higher education is to help students narrow or refine their learning interests to those that match degree programs. Although university services focus on the broader community, program areas support more specific academic and professional goals. Within programs, learners find course sequences and action plans designed to help them enter or progress in a desired profession. Within programs, learners interact with others who have similar goals and interests; they devote their time and energy to extend learning, collaborate with others, and strengthen professional relationships. Program policies and

procedures provide guidance about how to navigate the environment successfully, and how to deepen involvement with the learning community (Tinto, 1999).

A portion of community building occurs in courses. Within courses, students become better acquainted with each other and their instructors. They also gain additional knowledge regarding program and professional interests. Group projects, discussions, instructor feedback, and other activities are often cited as community promoters (Milman et al., 2015; O' Shea et al., 2015; Rockinson-Szapkiw & Wendt, 2015; Shepherd & Bolliger, 2019, 2023b). Although courses are useful for community promotion, they may be insufficient to develop sustained communities, particularly ones that extend beyond graduation and help students enter a larger profession (Shepherd & Bolliger, 2023a, 2023b). Courses are limited in duration, ranging from a few weeks to a few months. These short durations may provide insufficient interaction to yield the perceptions of trust, safety, belonging, and interdependence needed for sustained community formation (Bellah et al., 1985; Liu et al., 2007; Smith et al., 2017). Course-based communities put the onus of development and maintenance on individual faculty members. This onus is rarely supported in institutions of higher education and may not be sustainable (Bolliger et al., 2019; Fong et al., 2016; Larson & James, 2022). Additional services are required to sustain interaction, develop shared goals and histories, bolster a sense of belonging, and promote interdependence (Jason et al., 2015; Lee & Choi, 2011; Milman et al., 2015; Shepherd & Bolliger, 2019, 2023b).

Like the institutional level, program support consists of academic and social endeavors. Academic endeavors provide background knowledge to further enter the learning community, extend opportunities to collaborate and grow the knowledge base over time, and facilitate entrance or access to professional communities (Aldosemani et al., 2016; Wenger et al., 2002). These services (e.g., individual and group advising, research participation, reading groups, service learning opportunities, intern- and externships) extend interactions among students, faculty, and others over time; are not limited to course enrollments; and may broaden community foci (Shepherd & Bolliger, 2023b). Thus, programs represent a microcommunity within higher education institutions as well as within related professions.

Yet, social activities are also important for community formation and maintenance (Shepherd & Bolliger, 2019, 2023b). Social events promote shared experiences in non-threatening environments. These experiences provide easy access to faculty and other professionals that may otherwise seem beyond reach to online students (Exter et al., 2009). Additionally, social events may not be limited to online activities. Whereas some research suggests that reminders of on-campus activities further alienate distance students because they are reminded of the fewer services available to them (O' Shea et al., 2015), other studies suggest that campus-specific social events are helpful for community formation because most online students live within close proximity of campus (Shepherd & Bolliger, 2023b).

Individual

Regardless of the services provided for community facilitation and maintenance, students play an integral role in community formation. Most online students are nontraditional learners (Kang & Pak, 2023; Seaman et al., 2018). They are more likely to be older students, have dependent care responsibilities, and have years of experience in an occupation (Milman et al., 2015; Seaman et al., 2018). These students come with myriad support communities. While the majority indicate they want a sense of community within their degree

program, a smaller number state they have no desire for student and faculty interaction and the endeavors that promote it (Exter et al., 2009; O' Shea et al., 2015; Shepherd & Bolliger, 2023b). Indeed, when faculty members were surveyed about the importance of community in online degree programs, several indicated that limited student attendance made them second-guess their efforts (Bolliger et al., 2019). Expressed interests in community formation may not equate with actual effort. Community partners may need to better educate students regarding the purposes behind event creation and the role of community during and after graduation (Shepherd & Bolliger, 2023b). Additionally, it is likely that time in the program influences the desire for specific institutional and program activities. Those entering the program may desire social events as opportunities to get to know faculty members, community partners, and colleagues (Baker & Pifer, 2011; Pifer & Baker, 2016). More established students may desire opportunities to co-construct knowledge and network with the larger profession. Strengthening professional networks and communities may be a larger focus of those nearing graduation. Yet, little research has examined the time factors of community formation (Smith et al., 2017).

Research Purpose and Questions

The purposes of this study were to develop the Sense of Online Community Scale (SOCS), based on the framework developed by Shepherd and Bolliger (2023a), who focused on academic and social activities offered on the program and institutional levels, and to establish the instrument's reliability and construct validity. More specifically, the objectives of the study were to (a) develop an instrument to measure students' sense of community in online academic programs, (b) validate the instrument by verifying its factor structure, and (c) examine the relationships of the latent variables to time in an online program.

Method

The instrument was developed in two phases. First, several items were developed in different categories by the researchers. Once a first draft was generated, the instrument was reviewed by a panel of experts. Second, the instrument was validated by conducting a confirmatory factor analysis.

Phase 1: Instrument Development

Scale items were developed after an extensive literature search. Thirty items rated on a 5-point Likert-type scale (1 = strongly disagree, 2 = disagree, 3 = neither agree nor disagree, 4 = agree, and 5 = strongly agree) were developed for all factors. A "not applicable" response category was also included for all items. To ensure face validity, a panel of four experts reviewed the instrument prior to data collection. These individuals had at least six years of online teaching experience in higher education and were active researchers in online learning environments. All experts had terminal degrees; three faculty members held the rank of associate professor, and one person held the rank of professor emerita.

Panel members received instructions and the instrument via email. They were informed about the aim of the instrument and were instructed to review all items and categories for clarity and fit, modify items, and add or delete statements. Based on the reviewers' feedback, several items were revised, two items were

deleted, and items that addressed connectedness, trust, and affiliations were grouped into categories. The final version of the instrument included 28 Likert-type statements, one open-ended question, seven questions pertaining to participants' academic programs, and three demographic questions. Categories included the importance of program community, affiliation, and program and institutional elements. Program and institutional elements were divided into two subcategories: academic and social elements.

Phase 2: Instrument Validation

Participants and Data Collection

After approvals from all relevant Institutional Review Boards were obtained, data were collected from undergraduate and graduate students at one midsize, urban university located in the southern United States during fall 2021 and spring 2022 semesters. All students in online degree programs were invited to participate in the study via a mailing list. The invitation included the purpose of the study, its voluntary nature, and benefits and limitations of participation. A link to an anonymous online survey was embedded in the email invitation, and completers were informed that they could register for the drawing of one of ten $10 gift cards by providing their names and email addresses in a Google form. To increase the response rate, three reminders and "thank you" emails were sent (Dillman et al., 2014).

Data Screening

A total of 319 students responded to the survey. However, 26 cases had one third or more data missing and were deleted. The dataset included 16 outliers ($z = \pm 3.0$); however, these cases were deleted for the majority of analyses but not for testing the initial fit of the model. This resulted in 293 valid cases and a 14.4% response rate. Frequencies, mean scores, and standard deviations were generated.

Data were examined a priori to confirm parametric and multivariate assumptions were met. Bivariate correlations were examined for multicollinearity and correlations. There were no issues regarding multicollinearity, and correlations supported a priori expectations. All bivariate correlations between the subscales Program Community (items 1–6), Academic Program Activities (items 7–12), Social Program Activities (items 13–16), Academic Institutional Activities (items 17–22), Social Institutional Activities (items 23–26), and Institutional Affiliation (items 27 and 28) were significant and indicated initial support for the validation model.

Results

Descriptive Statistics

The means and standard deviations based on the data with outliers removed (more on the removal of outliers discussed later) are reported in Table 1. All means exceeded 3.5 on a 5.0 scale (1 = strongly disagree, 2 = disagree, 3 = neither agree nor disagree, 4 = agree, and 5 = strongly agree) except for one item. Within the Program Community subscale, the item with the highest mean was item 5 ($M = 4.42$, $SD = 0.68$), which pertained to the feeling of belonging to the academic program. Completing program milestones (item 8) was the highest rated item for the subscale Academic Program Activities ($M = 4.21$, $SD = 0.85$). Virtual or

remote social activities (item 14) was the highest rated item for the Social Program Activities subscale (*M* = 3.81, *SD* = 1.02). Academic support services provided by the institution (item 21) had the highest mean for the Academic Institutional Elements subscale (*M* = 4.14, *SD* = 0.86). Institution-wide initiatives regarding equity and inclusion (item 23) were most important for students in the Social Institutional Elements subscale (*M* = 3.87, *SD* = 0.93). With regard to Institutional Affiliation, students agreed the most with having a strong sense of affiliation with their current university (*M* = 3.76, *SD* = 1.06). Mean scores of all subscales ranged from 3.69 to 4.11. The Program Community subscale had the highest mean (*M* = 4.11, *SD* = 0.61), whereas the Social Program Activities had the lowest mean (*M* = 3.69, *SD* = 0.88).

Internal reliability coefficients, using Cronbach's alpha, were adequate for all subscales: (a) Program Community, α = .80; (b) Academic Program Activities, α = .80; (c) Social Program Activities, α = .89; (d) Academic Institutional Activities, α = .84; (e) Social Institutional Activities, α = .87; and (f) Institutional Affiliation, α = .88. According to Kline (2016) and Nunnally and Bernstein (1994), reliability coefficients greater than .80 are considered adequate. The correlation coefficients among the items ranged from .37 to .74.

Table 1

Descriptive Information for Survey Items and Subscales (*N* = 277)

Category and item	*M*	*SD*
Program community (Cronbach's α = .80)		
1. Having a sense of community in my program (e.g., a sense of belonging, interconnection, trust) is important to me	3.96	1.03
The following are important to develop a sense of program community:		
2. Trusting others in my program	4.23	0.72
3. Having similar interests with others in my program	3.95	0.90
4. Having similar experiences with others in my program	3.70	0.99
5. Feeling that I belong in my program	4.42	0.68
6. Feeling that I am affiliated with my program	4.37	0.76
Descriptives for program community category	4.11	0.61
Academic program activities (Cronbach's α = .80)		
The following elements help me feel like I am part of a program community:		

7. Program advising activities (e.g., orientations, retreats, guidance regarding course selection)	4.02	0.98
8. Completion of program milestones (e.g., portfolios, exams, defenses)	4.21	0.85
9. Opportunities to participate in faculty research (e.g., research groups, presentations, publications)	3.82	0.93
10. Opportunities to attend academic program events outside of courses (e.g., guest lectures, internships, field trips, professional meetings)	3.97	0.95
11. Professional resource sharing with others in my program (e.g., job postings, conference announcements, calls for proposal, professional services)	4.14	0.84
12. Taking required courses that include students from outside the program (e.g., statistics, writing)	3.61	1.04
Descriptives for academic program activities category	3.96	0.66
Social program activities (Cronbach's α = .89)		
The following elements help me feel like I am part of a program community:		
13. In-person social activities within my program (e.g., picnics, parties, get-togethers)	3.49	1.08
14. Virtual or remote social activities within my program (e.g., social media posts, online games, chat rooms)	3.81	1.02
15. Student-initiated social activities within my program	3.67	1.02
16. Professor-initiated social activities within my program	3.80	0.94
Descriptives for social program activities category	3.69	0.88
Academic institutional activities (Cronbach's α = .84)		
The following institutional elements help me feel like I am part of a program community:		
17. Academic events for multiple programs (e.g., capstone meetings, retreats, guest speakers, research days/symposia)	3.82	0.90

18. Student organizations associated with my program	3.86	0.88
19. Institutional wellness supports (e.g., personal counseling, health centers, fitness centers)	3.84	0.97
20. Institutional career services (e.g., career counseling, interview support, résumé building)	4.11	0.85
21. Institutional academic supports (e.g., writing centers, tutoring, library and research services)	4.14	0.86
22. Voluntary interest groups (e.g., social media groups, study or research groups)	3.78	0.93
Descriptives for academic institutional activities category	3.92	0.67
Social institutional activities (Cronbach's α = .87)		
The following institutional elements help me feel like I am part of a program community:		
23. Institution-wide initiatives regarding equity and inclusion	3.87	0.93
24. In-person or remote institution-wide sporting events (e.g., football, basketball, soccer)	3.65	1.06
25. In-person or remote institution-wide fine and performing arts events (e.g., plays, concerts, ballets, art galleries)	3.71	1.03
26. In-person or remote institution-wide celebrations (e.g., homecoming, graduation, Veteran's Day celebrations)	3.79	0.95
Descriptives for social institutional activities category	3.76	0.84
Institutional affiliation (Cronbach's α = .88)		
27. I have a strong affiliation (e.g., sense of membership) with my current online program	3.74	1.05
28. I have a strong sense of affiliation with my current university	3.76	1.06
Descriptives for institutional affiliation category	3.75	0.99

Note. Scale items ranged from 1 (strongly disagree) to 5 (strongly agree).

Confirmatory Factor Analysis (CFA)

A confirmatory analysis of the hypothesized structural model was carried out using Mplus software (Muthén & Muthén, 2010). Model fit and parameter estimates are presented below. The model represents the conceptual framework presented earlier in the paper. There were six subscales (Program Community, Academic Program Activities, Social Program Activities, Academic Institutional Activities, Social Institutional Activities, and Institutional Affiliation). The subscales Program Community, Academic Program Activities, and Academic Institutional Activities comprised six items each. The subscales Social Program Activities and Social Institutional Activities each contained four items, and the Institutional Affiliation subscale had two items. The Academic Program Activities and Social Program Activities subscales created an overarching construct called Program Elements. The construct Academic Elements was measured by Academic Institutional Activities and Social Institutional Activities.

Model Fit With Outliers

We evaluated structural model fit with several fit indices, such as the Comparative Fit Index (CFI values above 0.95 indicate very good fit, and those at or above 0.90 indicate reasonable fit; Bentler, 1990), Steiger's Root Mean Square Error of Approximation (RMSEA values below 0.05 indicate a very good fit, and those at or below 0.10 indicate a reasonable fit; Steiger, 1990), and the Standardized Root Mean Square Residual (SRMR < .05; Hu & Bentler, 1999). Model fit estimates for the model with outliers were either good or acceptable fit to the data (x^2 = 810.93, *df* = 342; CFI = 0.88; RMSEA = 0.08; SRMR = 0.07).

Model Fit Without Outliers

We also ran the model removing outliers. Outliers were determined to be responses with a *z*-score equal to or greater than 3.0. We evaluated structural model fit with several fit indices, such as the CFI (values above 0.95 indicate very good fit and those at or above 0.90 indicate reasonable fit; Bentler, 1990), Steiger's RMSEA (values below 0.05 indicate a very good fit and those at or below 0.10 indicate a reasonable fit; Steiger, 1990), and the SRMR (< .05; Hu & Bentler, 1999). Model fit estimates for the validation model were either good or acceptable fit to the data (x^2 = 812.78, *df* = 340; CFI = 0.86; RMSEA = 0.08; SRMR = 0.07).

Structural Path Estimates

Given that both models exhibited an acceptable/good fit to the data, we present the model with outliers removed (Figure 1). Estimates of the structural relationships among the model variables were interpreted. Estimated path coefficients were largely consistent with hypothesized linkages (all coefficients reported are standardized values and significant at $p < .05$). The best indicator of Program Community was item 6 (0.89), "Feeling that I am affiliated with my program," followed by item 5 (0.838), "Feeling that I belong in my program." For Academic Program Activities, the best predictor was item 10 (0.802), "Opportunities to attend academic program events outside of courses." Item 15 (0.907), "Student-initiated social activities within my program," was the best predictor of Social Program Activities. Item 22 (0.774), "Voluntary interest groups," was the best indicator of Academic Institutional Activities, and item 24 (0.867), "In-person or remote institution-wide sporting events," was the best indicator of Social Institutional Activities. Item 28 (0.888), "I have a strong sense of affiliation with my current university," was the best indicator of Institutional Affiliation. Academic Program Activities was a better predictor of Program Elements (0.920) than Social Program Activities, and Academic Institutional Activities was a strong predictor of Institutional

Elements (0.999). The correlation coefficients between the six factors ranged between 0.37 to 0.74 (Table 2). This suggests shared variance among the factors.

Figure 1

Confirmatory Factor Analysis Model

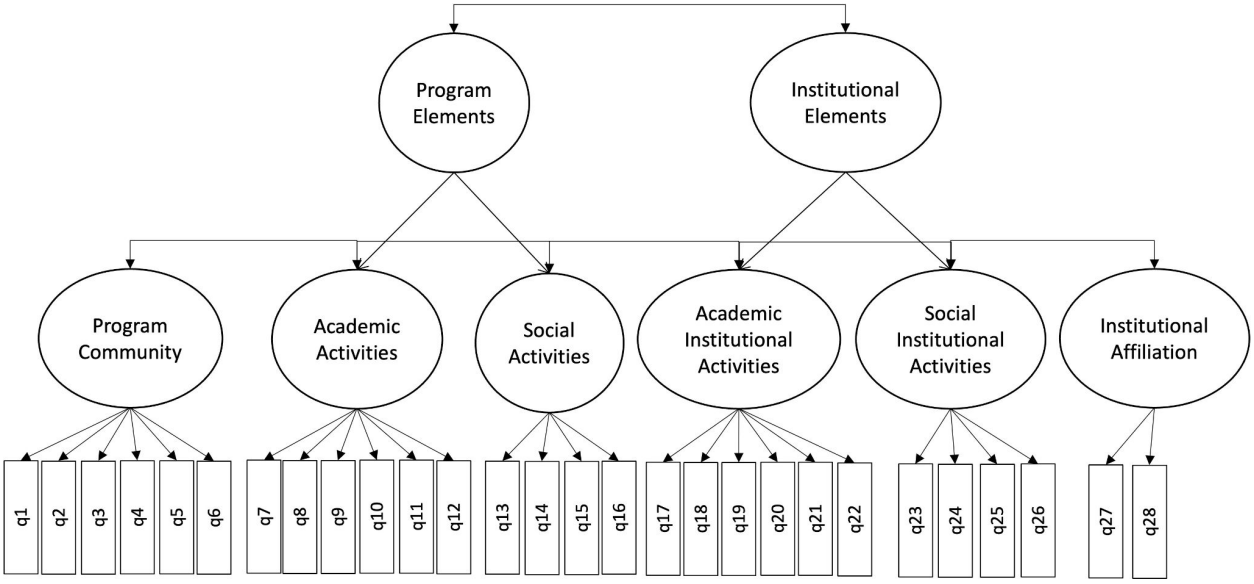

Table 2

Bivariate Correlations Coefficients Among the Six Factors

Factor	1	2	3	4	5
1. Program community					
2. Academic program activities	0.59				
3. Social program activities	0.55	0.65			
4. Academic institutional activities	0.52	0.66	0.60		
5. Social institutional activities	0.46	0.57	0.54	0.74	
6. Institutional affiliation	0.44	0.43	0.37	0.37	0.38

Time in Program

To examine the relationships of the latent variables to time in an online program, a regression analysis was performed. We created two constructs: (a) Academic Activities and (b) Social Activities (a combination of the program level and institutional level). Results suggested that time in an online program was not a statistically significant predictor of the validation model (standardized coefficient = 0.113). However, most students reported being in their first or second year. Because most students were early in their academic program (M = 1.625, SD = 0.8430), there was not much variability in the sample regarding time in program. The correlations between the constructs (Social, Academics, and Program Community) were examined. All correlation values were small and nonsignificant (Program Community, r = 0.063; Academic Activities, r = 0.114; Social Activities, r = 0.032).

Limitations

Readers should be aware of limitations in this study. First, only one institution was selected to participate, and the selection process was not random. Participants who completed the survey may have had biased responses, compared with those who did not respond to the invitation to participate. Second, because only one large, research-intensive, public institution in the southeast United States participated, the study is geographically limited. In the future, other researchers may include a variety of sites based on criteria such as location and type and or size of institution. Last, due to the type of study, all data were self-reported; hence, social desirability may have impacted some of the responses.

Discussion and Conclusion

Importance of Online Community

Overall, participants agreed that having a sense of program community was important to them (M = 4.11). A feeling of affiliation and belonging also received the highest mean scores (M = 4.37 and 4.42 respectively) and were the most predictive of the Program Community subconstruct. This comes as no surprise as these factors (along with trust) are commonly included as components of community formation (Glazer et al., 2013; McMillan & Chavis, 1986; Rovai, 2001; Shepherd & Bolliger, 2023a). Mean scores for the program community subscale surpassed those of the institutional affiliation subscale (M = 3.75). This is not surprising because programs are more tailored to the personal and professional interests of their students than institutions (Tinto, 1999, 2012). However, it is surprising that participants did not rate institutional affiliation as high, given their status as first- and second-year students. Several researchers claim that institutions play a large role in helping students enter and feel welcomed in a new learning community (Baker & Pifer, 2011; Lee & Choi, 2011; Pifer & Baker, 2016; Tinto, 1999, 2012). As students enter unfamiliar social systems, institutional supports can help them acclimate to the new environment. However, it appears overall affiliation with the institution was not as desired among participants. Disinterest in institutional affiliation may be based on the nontraditional nature of participants. They may have had existing support groups and been able to remain in familiar living environments as they matriculated through degree programs. Additionally, they were more likely to have specific personal and professional goals associated

with degree attainment, reducing the need for brand affiliation (Dennis et al., 2016). Regardless, program community is desired by most online students and is supported by institutional and program activities.

Academic Versus Social Activities

Across institutional and program events, participants rated academic activities higher than social activities for helping them feel like part of a program community. This finding is not surprising given the purpose of degree attainment and the nontraditional makeup of most online students, who often juggle family, professional, and personal activities with their educational pursuits (Milman et al., 2015; Stephen et al., 2020). It is noteworthy that although students rated completion of program milestones ($M = 4.21$), professional resource sharing ($M = 4.14$), and program advising activities ($M = 4.02$) higher than opportunities to attend academic program events outside of courses ($M = 3.97$), the latter was most predictive of the Academic Program Activities subscale. Similarly, although five of the six items in the Academic Institutional Activities subscale had higher mean scores than voluntary interest groups, the latter was the best predictor. Although all of these endeavors are useful for community formation and student persistence (Lee & Choi, 2011; Milman et al., 2015; Trespalacios et al., 2023), voluntary interest groups and extracurricular events may better capture student initiative to participate in community events because advising sessions, orientations, writing centers, and possibly research participation may be expected or mandated. Alternatively, some activities like orientations, advising, program milestones, and resource sharing may be expected norms in online programs and therefore not as indicative of program community efforts.

Remember, however, that the focus of this instrument was to move online community-building conversations beyond course activities. Thus, items regarding the role courses played in program community development were minimized. Although extracurricular events are the most predictive of Academic Program Activities, it does not mean that course activities are not useful for community formation. Ample research suggests that course endeavors play a major role in community formation (O' Shea et al., 2015; Rockinson-Szapkiw & Wendt, 2015; Rovai, 2001; Speiser et al., 2022). This instrument focuses on additional activities that lend to community formation.

Similarly, although institutional and program social activities were rated lower than academic activities, participants still rated them moderately useful for the formation of program community ($M = 3.76$ and 3.69 respectively). Interestingly, student-initiated activities emerged as the best predictor of the Social Program Activities subscale, even though professor-initiated social activities and virtual-remote social activities received higher mean scores. Again, it is possible the best predictive item captured student willingness and initiative to promote community. Additionally, although research suggests that most online students live within 50 miles of their institution (Seaman et al., 2018; Xu & Jaggars, 2013), participants rated in-person social activities lowest of all items in the social program activities subscale. This finding aligns with those of O' Shea et al. (2015), who reported that campus activities isolated some distance-based students by reminding them of unavailable opportunities. Despite this concern, the best predictor of the Institutional Social Activities subscale was in-person or remote institution-wide sporting events—despite having the smallest mean score on the subscale (behind institution-wide celebrations, equity and inclusion initiatives, and fine and performing arts events).

This finding regarding sporting events may demonstrate the desire of some students to align their educational interests and pursuits with the perceived prestige and branding of the institution (Dennis et al., 2016; Nathan, 2005). Students may want to tie their degree to an established and storied institution, believing that it may provide greater value than an online institution. More research is needed regarding this interpretation. Our study took place among online degree programs at a traditional brick-and-mortar institution. Students self-selected to attend this institution, and their views may not represent those of students who enroll in solely online institutions. Similarly, the institution competes in the top tier of collegiate athletics. In fully online institutions, university sports may not be a consideration. Yet, the predictability of institution-wide sporting events raises other questions. The United States has a long history of broadcasting collegiate sporting events to viewers across the nation via radio, television, and the Internet. Indeed, the means to provide these social activities at a distance predates most distance programs. The same may not be said of other social activities. Performing arts events, gallery exhibitions, student association events, and other endeavors do not receive comparable treatment. Thus, it is possible sporting events best predict Institutional Social Activities because they are the only social events consistently provided at a distance. Additional research is needed at fully online institutions as well as those without collegiate sporting programs to see how perceptions of institutional social activities compare at those locations.

Time in Program

Pifer and Baker (2016) alluded to time being a factor that impacts learner perceptions of community. As students become more familiar with norms and values, and as they progress in their academic programs by completing coursework and milestones, their desire may change for academic and social opportunities to connect with others in their program (Baker & Pifer, 2011; Pifer & Baker, 2016). However, results of this study did not show that learners' time in program was a good predictor. Because most of our participants were students in their first or second year of studies, the dataset was limited. There is a need for future research with a more representative sample in terms of time in program that includes undergraduate and graduate students.

Instrument Validity and Reliability

Evidence from the validation model in this study supports inferences from the SOCS. Results show that the instrument has good reliability and a good factor structure that supports the theoretical framework developed by Shepherd and Bolliger (2023a). Correlations among most of the subscales were moderate or low. However, a strong correlation was found between two of the subscales: Academic Institutional Activities and Social Institutional Activities (r = 0.74). Caution should be taken when using these subscales individually. Therefore, we recommend administering the entire scale to a sample.

In conclusion, the SOCS instrument is a reliable and valid instrument that other researchers may use to investigate community in online environments on the program and institutional level. Practitioners and administrators may use the instrument to develop appropriate academic and social activities for and make resources available to online learners that support the formation of community and assist in sustaining it.

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Teammate Familiarity in Distributed Computer-Supported Collaborative Learning: The Mediating Role of Social Presence

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Abstract

Owing to the limitations of computer-mediated communication (CMC), distributed CSCL (Computer-supported collaborative learning) has not always been as effective as desired. Despite recognizing the significance of group composition, the exploration of the function of teammate familiarity in distributed educational settings is restricted. This study explored the influence of teammate familiarity and social presence in a distributed CSCL setting by conducting an online survey of 288 Korean university students with experience in distributed CSCL. The results indicate that teammate familiarity increased the social presence experienced by students among their peers. Social presence subsequently enhanced teamwork satisfaction and, ultimately, increased self-assessed knowledge gain. More importantly, the relationship between teammate familiarity and teamwork satisfaction was mediated by social presence. Social media platforms and class webpages were the most widely used channels for students to get to know their teammates. Our study provided insights for improving the effectiveness of distributed CSCL and a framework for investigating social presence in satisfaction building in various contexts, including online education.

Keywords: distributed computer-supported collaborative learning, social presence, teamwork satisfaction, learning outcomes, teammate familiarity

Introduction

Computer-supported collaborative learning (CSCL) has emerged as a teaching and learning technique that uses different technological and pedagogical approaches to encourage the communal aspect of learning (Jeong et al., 2019). It has been widely applied in various learning environments, including classrooms, blended learning, and distance learning (Al-Samarraie & Saeed, 2018; Kreijns et al., 2003; Roberts, 2005; Suthers, 2006). The benefits of CSCL have been demonstrated from various angles (Dillenbourg et al., 2009; Gress et al., 2010; Kreijns et al., 2003). A meta-analysis has also revealed the positive effects of CSCL (Chen et al., 2018; Jeong et al., 2019). However, low engagement and poor satisfaction render CSCL a challenging process that may fail to produce desirable results (De Backer et al., 2022; Zhang et al., 2023).

The COVID-19 pandemic and the rapid growth of distance education have led to an increasing number of CSCL implementations in online and distributed formats. In this study, we use the term *distributed CSCL* to describe the CSCL in a distributed learning environment. Compared with offline CSCL, students engaged in distributed CSCL face added hurdles. Specifically, the modes of interaction and social distance limit social interaction in distributed CSCL (Surani & Hamidah, 2020; Zhang et al., 2023; Zheng et al., 2022). Additionally, establishing students' sense of community in online settings can be more difficult owing to the constraints of computer-mediated communication (CMC; Baturay & Toker, 2019; Kreijns et al., 2003). All these aspects place distributed CSCL at a disadvantage, making it crucial to enhance the efficiency and satisfaction of students in distributed CSCL.

As stated by Farland et al. (2019) and Post et al. (2020), group composition always plays an important role in designing collaborative learning. Allowing students to team up with individuals they are familiar with can lead to positive outcomes, including improved team building behaviors, greater satisfaction, and better group performance in traditional and blended learning settings (Adams et al., 2005; Castellá et al., 2000; Hinds et al., 2000; Janssen et al., 2009; Rockett & Okhuysen, 2002). However, existing studies have revealed several shortcomings. First, in the educational context, the impact of teammate familiarity has been explored in a very limited number of studies (Janssen et al., 2009). Additionally, many studies have incorporated teammate familiarity as a combined factor and overlooked its function as a distinct variable (Ku et al., 2013). Furthermore, the examination of the influence of teammate familiarity in a distributed educational context has been conducted in a restricted number of studies (Zhang et al., 2023).

To address the aforementioned research gaps and better understand the role of teammate familiarity in distributed CSCL, the following research objectives were set for this study. First, this research examined how the learning outcomes of distributed CSCL are influenced by the level of familiarity among group members. Second, in line with Janssen et al. (2009), teammate familiarity may not be directly related to behavioral learning outcomes, and the effects of mediating variables need to be considered. Therefore, this study investigated the mechanisms that underpin the correlation between teammate familiarity and learning achievements through social presence and teamwork satisfaction. Third, this study attempted to understand the process by which students become familiar with each other in a comprehensive online environment.

Literature Review

Collaborative Learning, Teammate Familiarity, and Satisfaction

Collaborative learning involves learners working together in groups to achieve shared learning objectives (Dillenbourg, 1999). Social construction theory (Caceffo et al., 2022) emphasizes that the acquisition of knowledge is based on a process of negotiation with others. Therefore, collaborative learning has been widely acknowledged as an effective instructional approach since the 1970s (Anderson et al., 2010). CSCL is also receiving increasing attention as a computer-mediated model of collaborative learning (Gress et al., 2010; Kreijns et al., 2002, 2003). The interest in distributed CSCL has increased with the popularity of distance education. CMC tools connect group members living in different geographical areas as well as facilitate synchronous and asynchronous communication and interaction during collaboration (Hernández-Sellés et al., 2019). In the current study, the term distributed CSCL is conceptualized as computer-supported collaborative learning in distance and distributed learning settings.

Teammate familiarity is commonly defined as the degree to which individuals are acquainted with other members of a group. In traditional face-to-face collaborative learning settings, teammate familiarity improves the affective learning outcomes of collaborative learning (Falcione et al., 2019; Ku et al., 2013). However, its impact on behavioral learning outcomes remains uncertain. Walther (1992) stated that as individuals become familiar with their learning partners, intimacy between them may increase. It has the dual benefit of not only decreasing the psychological distance created by physical separation but also aiding in surmounting the inherent constraints of the CMC medium, such as the absence of nonverbal cues. Therefore, we believe that teammate familiarity plays an important role in distributed CSCL.

Previous research has consistently reported that satisfaction is associated with positive learning outcomes (Goh et al., 2017; Van Alten et al., 2019; Zhonggen et al., 2019). In the current study, satisfaction is defined as student satisfaction with their distributed CSCL. Zhang et al. (2023) showed that teammate familiarity positively influenced student teamwork satisfaction with collaborative learning, both face-to-face and computer-supported. Drawing upon empirical findings, the present study puts forth the following hypothesis:

H1: Teammate familiarity increases students' teamwork satisfaction in distributed CSCL.

Social Presence

Social presence refers to the degree to which individuals perceive and experience a sense of connection, engagement, and presence in a social interaction or online environment (Short et al., 1976). The definition and evaluation of social presence in various empirical situations have garnered growing attention since its inception (Dahlstrom-Hakki et al., 2020; Kim & Song, 2016; Song et al., 2014). However, social presence is generally considered to be the psychological experience of engaging in interactions with others in a mediated environment while being unaware of the presence of technology (Biocca et al., 2003). Furthermore, Gunawardena and Zittle (1997) proposed that immediacy (the time lag between replies) and intimacy (the connection between interaction partners) during CMC are significant factors that affect social presence.

Social presence is regarded as one of the key elements in understanding CMC (Short et al., 1976). For example, social presence facilitates the psychological and physiological responses during CMC (Lombard & Ditton, 1997). According to the Community of Inquiry (CoI) framework (Garrison et al., 1999), the emphasis on social presence aligns with the idea of creating a supportive and interactive online learning environment. Therefore, social presence has been recognized as a vital component in fostering meaningful social interactions among educators and learners, as well as among students within an educational setting. Particularly, previous studies have documented that social presence is positively associated with students' learning experiences and outcomes (Hostetter & Busch, 2006; Swan & Shih, 2005).

In CSCL, strategies that promote a sense of connection and belonging among learners have been deemed critical (Harasim, 1993; So & Brush, 2008). Therefore, social presence has been identified as a predictor of decreased psychological distance in CSCL (Nam, 2017; So & Brush, 2008; Tseng et al., 2015). However, social presence may have a more complex role beyond being a predictive factor, as observed in various educational settings (Khan & Rafi, 2020; Kim et al., 2013; Lee et al., 2011). Furthermore, one of the most notable functions of social presence is that of a mediator, which explains the reason behind certain online behaviors resulting in particular experiences (Song et al., 2019). The present study predicted that social presence mediates distributed CSCL and proposed the following hypothesis:

H2: Social presence mediates the relationship between teammate familiarity and teamwork satisfaction in distributed CSCL.

Model Testing With Collaborative Learning Outcomes

Prior research has showcased the advantages associated with satisfaction derived from teamwork in the context of collaborative learning (He & Huang, 2017; Ku et al., 2013; Tseng et al., 2009). In particular, teamwork satisfaction was positively correlated with collaborative learning outcomes (He & Huang, 2017; Tseng & Ku, 2011).

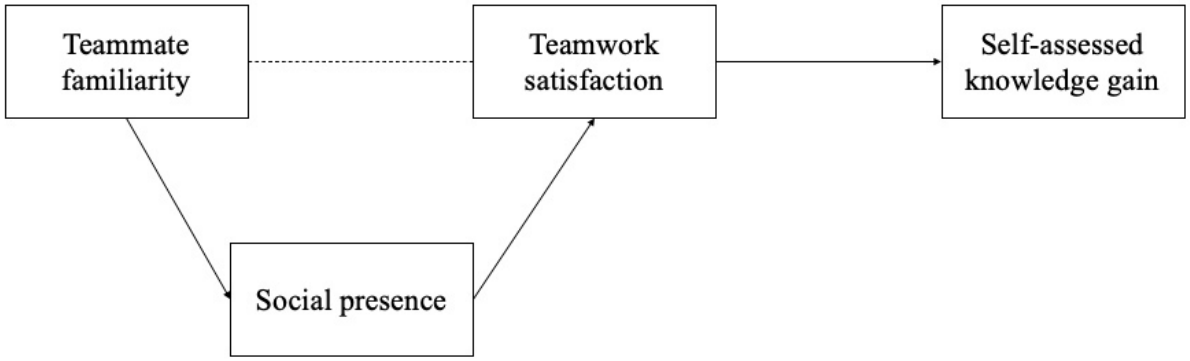
The objectives of higher education extend beyond mere academic knowledge acquisition; thus, comprehending the impact of the above-mentioned social factors on collaborative learning outcomes in educational environments is essential. Janssen et al. (2009) revealed that there is no significant association between familiarity and students' group performance. Conversely, Ku et al. (2013) suggested that team acquaintances and satisfaction are highly correlated. One reason for this inconsistency may be that teammate familiarity is an indirect rather than a direct factor that influences collaborative learning among students. More specifically, teammates may not automatically improve the collaborative learning outcomes of students. Instead, this may promote satisfaction, which may subsequently improve collaborative learning outcomes. Thus, student learning may result from the process that demonstrates the impact of teammate familiarity rather than being a direct outcome.

Drawing on the above information, this study has proposed a model that posits that teammate familiarity boosts teamwork satisfaction through social presence, as postulated in hypotheses H1 and H2. Thus, augmented satisfaction enhances the efficacy of collaborative learning. Figure 1 illustrates the proposed model.

H3: Self-assessed knowledge gain is positively affected by teamwork satisfaction, which is predicted by teammate familiarity and mediated by social presence.

Figure 1

Hypothesized Model Showing Proposed Relationship Between Social Presence and Measured Variables



To further understand practices that promote teammate familiarity in distributed CSCL, this study explored additional research questions. Specifically, given that CMC provides multiple channels of communication for students' learning processes, understanding students' use of communication channels to know and become familiar with their teammates provides meaningful insights. With this in mind, the following research question was pursued:

RQ: How do students get to know and become familiar with their peers in a distributed CSCL?

Method

Participants

Participants with experience in distributed CSCL were recruited from Korean universities. In total, 288 people returned completed questionnaires between August 3 and September 30, 2022. The participants' demographic characteristics are provided in Table 1.

Table 1

Sociodemographic Characteristics of Participants

Characteristic	*n*	%
Gender		
Male	121	42
Female	167	58
Educational level		
Undergraduate	224	78
Graduate	64	22
Discipline	121	42

Social science and humanities		
Natural science	167	58

Note. N = 288. Participants were on average 22.88 years old (SD = 2.74).

Procedure

An anonymous online questionnaire was administered. To eliminate any potential language comprehension difficulties for our subjects, we engaged the services of two proficient translators to render the questionnaire into Korean. This translated version was subsequently evaluated by two bilingual researchers. Furthermore, 15 Korean university students with experience in distributed CSCL participated in a pilot study to test and offer feedback and suggestions on the draft questionnaire. Finally, certain items were modified based on these suggestions. To recruit participants, we sent students a link to a Google form via social media platforms such as Kakao Talk.

Measures

In the first section, the students were provided with an explanation of the questionnaire's purpose and how the collected data would be used. After signing the consent form, students gave us demographic information, such as gender, age, nationality, educational level, and majors, and we then used the following screening question to select eligible participants: Have you ever participated in distributed collaborative learning?

The second section measured the level of teammate familiarity based on participants' recent experience of distributed CSCL using a 7-point Likert scale for those who had participated in distributed CSCL. To further clarify the meaning of teammate familiarity and rationally determine the rate of familiarity experienced by the participants, we composed three yes-or-no questions according to the study by Janssen et al. (2009). Examples of this type of question include: "Apart from online studies, my teammates and I have a connection in life," and "I have previously engaged in online collaboration with a few members of my group." Finally, the authenticity of the teammate familiarity measure was verified via three yes-or-no questions. The results revealed a significant correlation (r = 0.74, p < 0.02) between the three yes-or-no questions and teammate familiarity (M = 3.13, SD = 1.14).

The third section involved subscales related to social presence, teamwork satisfaction, and self-assessed knowledge gain, which were extracted and modified from existing online learning research. Social presence was measured by items cited from Song et al. (2019), such as "I feel like my teammates are learning with me in online collaborative learning," and "In my group, my teammates and I form an online community." Teamwork satisfaction was measured with items cited from Ku et al. (2013), such as "I enjoy working with my team on assignments or problem solving." Self-assessed knowledge gain was measured by items such as "I learn a lot from distributed computer-supported collaborative learning," and "I can interconnect the knowledge gained from distributed computer-supported collaborative learning" (Kim et al., 2016). On the 7-point Likert scale, all items were rated from *strongly disagree* to *strongly agree* or from *always* to *never*. The last section measured the ways for students to get to know and become familiar with their peers in a distributed CSCL.

Data Analysis

For data analysis, SPSS (Version 23) and Amos (Version 26) were employed in this study. First, we carried out descriptive and correlational analyses of the data with the help of SPSS. Subsequently, with the help of Amos, we completed model fitting analysis, parameter estimation, and path analysis.

Results

Reliability Examinations

The first step was to estimate the measurement model, e.g., the confirmatory factor analysis model, which described the extent to which the observed indicators measured the latent constructs. As shown in Table 2, the Cronbach's alpha values for all items exceeded the standard threshold of 0.70 (Tavakol & Dennick, 2011). All average variance extracted (AVE) values exceeded the recommended threshold of 0.5 (Fornell & Larcker, 1981). For composite reliability (CR), all values were greater than the recommended value of 0.7 (Bacon et al., 1995). Moreover, as shown in Table 3, we confirmed that each square root AVE value was greater than the inter-construct correlations in accordance with previous studies (Fornell & Larcker, 1981). We, therefore, confirmed that the questionnaire we developed passed reliability and validity tests.

Table 2

Assessing Questionnaire Quality: Reliability and Convergent Validity Analysis

Indicators	SP	TS	SKG
Cronbach's alpha	0.82	0.90	0.80
Convergence validity (AVE)	0.61	0.76	0.57
Composite reliability (CR)	0.82	0.90	0.80

Note. SP = social presence; TS = teamwork satisfaction; SKG = self-assessed knowledge gain.

Table 3

Discriminant Validity: Analysis of Inter-variable Variability

Constructs	TF	SP	TS	SKG
TF				
SP	0.557	0.780		
TS	0.535	0.805	0.870	
SKG	0.349	0.720	0.641	0.760

Note. TF = teammate familiarity; SP = social presence; TS = teamwork satisfaction; SKG = self-assessed knowledge gain.

Model Fit

Next, the structural model was executed to compute the fit indexes. As presented in Table 4, several important indexes, including the chi-square to the degree of freedom ratio (χ^2/df; Kock & Lynn, 2012), Tucker-Lewis index (TLI; Marsh et al., 1988), comparative fit index (CFI; Bentler, 1990), and Goodness-of-Fit index (GFI; Kline, 2005), as well as the root-mean-square error of approximation (RMSEA) (Steiger, 2007), were employed to evaluate the model fit. According to previous studies (Kline, 2015), we also list the criteria for each index in Table 4. Upon comparing these values with the standard benchmarks, it is evident that all our model indicators meet the acceptable criteria.

Table 4

Statistical Indicators to Assess Model Fit

Index	Criteria	Research model results
χ^2/df	$1 < \chi^2/df < 3$	2.993
GFI	> 0.9	0.940
CFI	> 0.9	0.960
TLI	> 0.9	0.943
RMSEA	< 0.08	0.080

Hypotheses Testing

To examine the aforementioned hypotheses, we conducted a path analysis. The results are presented in Table 5. The obtained path coefficients indicate that teammate familiarity is not significantly associated with teamwork satisfaction ($\beta = 0.12$, $p = 0.05$). Therefore, Hypothesis 1 is not valid. However, a positive association was found between teammate familiarity and social presence ($\beta = 0.53$, $p < 0.001$). Additionally, a strong and favorable correlation was present between social presence and teamwork satisfaction ($\beta = 0.89$, $p < 0.001$). More specifically, social presence mediated the relationship between teammate familiarity and teamwork satisfaction, which supports Hypothesis 2. Finally, the perceptions of knowledge gain and satisfaction were found to be significantly correlated ($\beta = 0.57$, $p < 0.001$), indicating that Hypothesis 3 is valid.

Table 5

Path Coefficients Between Teammate Familiarity and Measured Variables

Path	Estimate	*SE*	CR	*p*-value
TF→TS	0.12	0.06	1.99	0.05
TS→SKG	0.57	0.06	9.84	***
TF→SP	0.53	0.06	9.11	***
SP→TS	0.89	0.09	10.13	***

Note. CR = critical ratio; TF = teammate familiarity; TS = teamwork satisfaction; SKG = self-assessed knowledge gain; SP = social presence.

***$p < 0.001$.

Moderation Analysis

Finally, social presence was evaluated as a moderator. The outcomes presented in Table 5 reveal that the connection between teammate familiarity and satisfaction in distributed CSCL is significantly and positively influenced by social presence. Additionally, as the direct effect between teammate familiarity and teamwork satisfaction is not significant, social presence fully mediates the relationship.

Communication Channels for Getting Familiar

Further analysis was conducted to answer the main RQ concerning peer interaction in a distributed CSCL. The results are listed in Table 6.

Table 6

Communication Channels for Students in Distributed CSCL Settings

Channel	Students Who Accessed Channel	
	n	%
Social media	252	87.5
Class webpage	218	75.7
Email	62	21.5
Video conference	25	8.7

Note. $N = 288$.

Approximately 87.5% of participants ($n = 252$) reported that they get to know their teammates through social media platforms, followed by the class webpage (75.7%, $n = 218$), email (21.5%, $n = 62$), and video conferences (8.7%, $n = 25$).

Discussion

Learning is inherently social because students acquire knowledge through interactions with one another (Kalina & Powell, 2009). Effective communication and satisfaction building in CMC can be challenging owing to limited social cues and nonverbal information (Song et al., 2019). There is a wealth of literature that consistently underscores the pivotal importance of satisfaction in the efficacy of collaborative learning (Ku et al., 2013; So & Brush, 2008; Zhu, 2012); therefore, examining methods to foster satisfying teamwork in distributed CSCL is necessary. The present study investigated the influence of teammate familiarity and social presence on teamwork satisfaction and its contribution to collaborative learning outcomes.

The findings of this study suggest that familiarity among group members is not high in distributed CSCL environments ($M = 3.13$, $SD = 1.14$). We speculated that this result may be attributed to the following: first, the limitations of the online environment, such as limited nonverbal cues (Lo, 2008). Second, increasing familiarity through online communication is more difficult than in face-to-face settings (Pauwels et al., 2016). Third, the social distance limitations caused by COVID-19 resulted in a lack of opportunities for students to become familiar with each other (Vaterlaus et al., 2021). Knowing basic information about individuals is the first step toward building relationships (Song et al., 2019); therefore, the lack of knowledge regarding peers in distributed CSCL is likely to negatively impact teamwork satisfaction and potential learning outcomes. The results of the present study support this concern, suggesting that teammate familiarity affects the sense of social presence experienced in CMC, which subsequently affects satisfaction and ultimately self-assessed knowledge gain.

This study elucidates the potential mechanisms by which teammate familiarity affects teamwork satisfaction in a distributed CSCL environment. In particular, the findings of this study identify an important mediating role for social presence between teammate familiarity and teamwork satisfaction. This suggests that familiarity among group members can only contribute to the formation of effective relationships among students if it successfully enhances their sense of social presence. The present

study contributes to the theoretical understanding of the relationship between familiarity and relationship perceptions in distributed settings.

In this study, teammate familiarity is regarded as an independent variable within the context of distributed CSCL. Existing studies have examined teammate familiarity as a component of teammate relationships (Ku et al., 2013; Zhu, 2012). This trend appears to be compounded in the context of distributed CSCL, as familiarity with CMC has been confounded with the use of other relevant variables (Child & Petronio, 2011). In light of these observations, this study highlights inter-member familiarity as an important factor in enhancing social presence in distributed CSCL environments through independent measurement and exploration of teammate familiarity.

Existing literature explores the direct impact of social presence in online collaborative learning (So & Brush, 2008). However, the current study makes a significant contribution to advancing our understanding of social presence by emphasizing its mediating role in distributed CSCL. To our knowledge, this study is the first to explore the mediating role of social presence in distributed CSCL environments. In addition, this study demonstrates the importance of social presence on relational perceptions such as teamwork satisfaction in a collaborative learning context. With the increasing popularity of Internet-based applications in which individuals build relationships virtually (e.g., learning communities and learning groups), further research is required to understand the influence of social presence.

Our survey results show that in distributed CSCL, the familiarity of the team members reported by students is relatively low (M = 3.13, SD = 1.14). However, as the answer to our RQ indicates, social media platforms (n = 252 [87.5%]) and class webpages (n = 218 [75.7%]) are useful ways to help students get to know their teammates. Our findings further emphasize the complementary role of social media for online learning (Friedman & Friedman, 2013; Zhang et al., 2023), i.e., students' disclosure of personal information or active interaction with other students on social media provides an avenue for students to get to know each other. Furthermore, participants' profiles on the course homepage are also suggested as an aspect that cannot be ignored. Mutual understanding between students in a distance learning environment is also facilitated by encouraging them to provide relevant personal information on these homepages.

CSCL does not simply involve technology-assisted knowledge transfer or transmission but also involves student-to-student communication and connection (Hernández-Sellés et al., 2019). Therefore, the findings of this study have important practical implications. In distributed CSCL, teamwork satisfaction and, ultimately, self-assessed knowledge gain begin with familiarity with the group members. Our result is in line with previous studies (Hinds et al., 2000; Janssen et al., 2009; Rockett & Okhuysen, 2002), indicating that familiarity among teammates is the first step toward fulfilling the objectives of collaborative learning. Owing to the importance of distributed CSCL, we encourage active interaction between group members to increase familiarity with each other prior to engaging in collaborative learning. Furthermore, social media platforms and class webpages should also be actively used to help students get to know their teammates in distributed CSCL.

Limitations and Future Studies

Although this study contributes toward improving the efficiency of collaborative learning, some limitations exist. First, the current study has framed and scoped the research from an educational psychology perspective but has neglected the pedagogical and technical aspects of distributed CSCL. There is a great deal of diversity in the design and strategy of distributed CSCL activities, such as synchronous, asynchronous, or mixed synchronous and asynchronous activity designs. Future research could therefore explore how teammate familiarity contributes to distributed CSCL at diverse levels.

Another limitation of this paper pertains to the methodology employed. The data collection method relies on self-reported surveys; therefore, the measurement of student learning outcomes is based on students' subjective perceptions rather than objective assessments. Although, as mentioned in Song et al. (2016), university students are already considered capable of conducting valid self-assessments, it is important to acknowledge that self-reported results can still introduce a degree of inconsistency with the truth to some extent. Future research should therefore draw on experiments to analyze the role of teammate familiarity more scientifically and objectively in distributed CSCL.

Conclusion

The role of teammates' familiarity in the context of distributed CSCL is a controversial topic. Our study explains the controversial nature of research related to teammates familiarity by setting social presence as a mediating variable. Our findings suggest that there is no significant association between teammate familiarity and teamwork satisfaction. Instead, social presence plays a mediating role in the relationship between teammate familiarity and teamwork satisfaction. Additionally, there is a significant relationship between perceived knowledge acquisition and teamwork satisfaction. Finally, although the familiarity of teammates in distributed CSCL is relatively low, social media and the homepage of learning websites provide important channels for students to acquaint themselves with their teammates in a distributed learning environment.

With the popularity of distributed CSCL and online learning, the results of this study provide insights and strategies for practitioners to improve CSCL in distributed learning environments. Specifically, assigning students who are familiar with each other to a group may be an effective way of grouping students. Moreover, encouraging students to self-disclose and actively interact with other students through social media and the homepage of the learning website may help students get to know each other, thus improving the efficiency of distributed CSCL.

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Declarations

The authors declare that they have no competing interests.

Data Availability Statement

The data that support the findings of this study are available from the corresponding author upon reasonable request.

Informed Consent

All participants were informed about the aim and scope of the study as well as the ways the data would be used. The respondents' participation was completely consensual, anonymous, and voluntary. Informed consent was obtained from all individual participants included in the study before they participated in the survey. The rights of respondents are safeguarded in this study, in line with the Declaration of Helsinki.

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Weaknesses in Emergency Remote Teaching in Higher Education Within the Context of the ODL Learning Component in Turkey

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Abstract

In critical situations caused by crises such as a pandemic, emergency remote teaching (ERT) practices might not be effective because they depend mostly on on-the-spot decision-making. On the other hand, open and distance learning (ODL) has its own dynamics and is a well-planned system. In order to put quality ODL plans into practice in crisis situations, contingency plans, created before any crises, are required. Past crises ought to be examined in order to cope with future crises effectively. This study aims to identify weaknesses in ERT practices in higher education within the context of the learning component of ODL system by focusing on COVID-19 and using it as an example of a past crisis. Exploratory case study was the method used. The study group consisted of 14 faculty and 14 learners from 14 higher education institutions. Qualitative data were collected via semi-structured interviews and documents. The data were analyzed using descriptive and content analysis. Research findings revealed that ERT has many weaknesses in several themes within the context of the learning component of the ODL system; these include teaching method, course structuring, and e-learning materials, among others. In light of the findings, it can be concluded that many factors influence challenges in ERT. Accordingly, to be able to move from ERT to ODL in the next crisis, these weaknesses need to transform into solutions in advance.

Keywords: weaknesses in emergency remote teaching, ERT, open and distance learning, ODL, higher education, crisis, COVID-19

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In crisis situations like pandemics, although positive steps are taken toward ensuring continued delivery of education, the abrupt switch to using distance education technologies may also involve initiating poorly planned instructional practices. In these situations, the solution to ensure the continuity of education might be emergency remote teaching (ERT), where rapid solutions are produced with sudden decisions, instead of the more ideal open and distance learning (ODL), which is well planned and accounts for contextual dynamics (Hodges et al., 2020). Pre-crisis planning is thus needed to implement proper ODL practices in crisis situations (Burns, 2020). To achieve emergency preparedness for other potential crisis situations, the limitations involved in the ERT processes will determine any proposed solutions first, and then the instructional design of higher learning will be revised by analyzing how the educational transformation will be made and how distance education can be implemented more effectively during the post-crisis period (YÖKAK, 2020). In addition, considering that ODL is a system composed of management, learning, interaction, technology, assessment and evaluation components, and each of these affects the whole system, ERT practices should be systematically evaluated as well. However, a review of the literature shows that the studies examining ERT practices have not been carried out within a systematic framework—for example, a systems approach—and the study groups are mostly limited to individuals in a program or an institution in qualitatively designed studies (Alasmari, 2021; Kaya & Işık, 2021; Lassoued et al., 2020; Valsaraj et al., 2021). The purpose of this study is therefore to identify the weaknesses embedded in ERT in higher education within the context of the *learning* subsystem of ODL. The following research question guided this study: What are the shortcomings of ERT implemented in higher education regarding the learning component of the ODL system?

Related Studies

Various studies have revealed weaknesses in ERT. Valsaraj et al. (2021) showed that most faculty feel that they lack skill-based knowledge needed to deliver online education. Dhawan (2020) revealed that learners and instructors in various universities had not previously experienced online learning, and most were content with traditional education methods. In the study by Kaya and Işık (2021), learners reported that instructors needed to improve their technology skills and engagement of learners through interactive lectures, that they could not acquire skills in applied courses, that they did not take distance education as seriously as traditional education, and that they lacked motivation. Song et al. (2020) showed that inexperienced instructors needed training in using online technologies and integrating asynchronous discussions into online teaching. Lassoued et al. (2020) reported that some of the barriers to quality ODL were learners' low motivation to participate in distance education, faculty's disbelief in the effectiveness of distance education, learners' and instructors' reluctance to practice distance education, and inadequate skills needed to use technology. Alasmari (2021) found that 42.2% of the participants had low skill levels for using computers and the Internet, and this had a negative impact on their full inclusion in the course. Frangou and Keskitalo (2020) revealed that learners in ERT needed help in reducing their workload. Valsaraj et al. (2021) determined that the most important challenge in ERT was to engage learners. In addition, some studies have reported the inability to effectively carry out clinical and laboratory practices

in the field of nursing and medicine via ERT to be a negative factor (Kürtüncü & Kurt, 2020; Mukhtar et al., 2020; Oliveira et al., 2021; Sarı et al., 2022; Sindiani et al., 2020). According to a study by TÜMA (Karadağ & Yücel, 2021, p. 15), most learners did not find the e-learning materials offered in ERT to be engaging and of high quality. Oliveira et al. (2020) found that learners were burdened by a high level of cognitive load in ERT, as online lessons were taught without a break. Omodan (2020) revealed that technological inadequacies and inexperience resulted in the use of teacher-centered methods. Arayüz Kampanyası (2020) showed that some instructors viewed the process as temporary and therefore had low motivation toward ERT, and some participants did not approve of the time limit for access to course recordings on the grounds that it reduced the possibility for learners to review them later. The study also revealed that institutions were offering their online course recordings late or not at all, and lecture presentation varied between synchronous lectures only, online course recording, or document sharing. Additionally, there were practices in which the instructor was informally substituted by assistants.

Conceptual Framework of Study

Perraton's theory of distance education consists of elements from existing theories of communication and diffusion, as well as philosophies of education. One of the 14 statements asserted by the theory is "a systems approach is helpful in planning distance education" (Simonson et al., 2015, p. 49). Considering that ERT needs to be transformed into ODL in the next crisis, using a system approach will be helpful in examining ERT as well. By reviewing the literature, ODL components are considered as management, learning, interaction, technology, and assessment and evaluation by the researcher (Eby, 2013; Moore & Kearsley, 2012). The focus in the current study is on the *learning* component of ODL under the sub-components including learners, faculty, learning materials, teaching method, and course structuring.

Methodology

Research Design

An exploratory case study design was used in the current study. Creswell (2007, p. 73) defines *case study* as a qualitative research approach in which one or a few situations with certain boundaries are discovered over time by collecting in-depth information with multiple data collection tools such as observation, interview, audio-visual materials, documents, and reports; additionally, the situation and themes related to the situation are defined. Depending on the purpose for which it is carried out, Yin classifies case study into three categories: exploratory, descriptive, or explanatory (Yin, 1981, p. 110; 1994, p. 38; 2003, p. 3). Focusing on the question of "what?" makes a case study exploratory (Yin, 2003, pp. 5–7). In the current study, an exploratory case study was used to seek in-depth answers to the question of what the weaknesses of ERT in higher education are as part of the learning component of the ODL.

Participants

The study participants were 14 faculty and 14 learners from 14 higher education institutions in Turkey. The criterion sampling method was used in the study. In the selection of the higher education institutions, the

following criteria were used: (a) representing all seven geographical regions in Turkey, (b) representing both foundation and state universities, and (c) representing universities that have above- and below-average distance education satisfaction scores reported in the *Distance Education Turkey University Satisfaction Survey [TÜMA]* (Karadağ & Yücel, 2021), which collected quantitative data from 42,353 learners studying at 198 universities, including 125 state and 73 foundation universities. The criterion of having taken a course in the ERT process was used to select the learner participants who formed the study group. The criteria of having given lectures in the ERT process or having taken part in administrative processes were used to determine the faculty participants. From among the institutions meeting the determined criteria, institutions where the researcher could easily contact faculty and learners were included in the research. To keep the identity of the higher education institutions included in the research confidential, codes 1 and 14 were assigned to the institutions. The characteristics of the selected higher education institutions are presented in Table 1.

Table 1

Characteristics of the Higher Education Institutions

Institution code	Region	Type	TÜMA (Karadağ & Yücel, 2021) distance education satisfaction average
1	Mediterranean	State	Above average
2	Mediterranean	State	Above average
3	Eastern Anatolia	State	Below average
4	Marmara	Foundation	Above average
5	Southeastern Anatolia	State	Below average
6	Marmara	State	Below average
7	Central Anatolia	Foundation	Above average
8	Aegean	State	Above average
9	Central Anatolia	State	Below average
10	Eastern Anatolia	State	Below average
11	Southeastern Anatolia	State	Below average
12	Black Sea	State	Above average
13	Aegean	State	Above average
14	Black Sea	State	Above average

After selecting institutions, 14 volunteer faculty and 14 volunteer learners representing each were included in the study.

Data Collection

In case studies, data can be collected through interviews, records, documents, visual materials, and observations (Yin, 1981). The data in the current study were collected through interviews and review of documents. Semi-structured interviews were conducted with a total of 28 participants, including 14 learners and 14 faculty. The ODL literature was reviewed during preparation of the interview questions (Eby, 2013; Moore & Kearsley, 2012). To increase the clarity of the questions, the subcomponents of the learning component, such as the learner, the faculty, the course structure, the teaching method, and the e-learning materials, which were created by the researcher by reviewing the literature, were also included in the research question. Before the interviews, experts were consulted for their opinion on the questions, and a pilot interview was conducted with a learner and a faculty member. The same interview questions were used both for the faculty and learner participants. The interviews took place between February and May 2022. All interviews were conducted over the phone and recorded with participants' consent.

The documents examined to inform the research were the senate decisions taken during the ERT process, 2020–2021 internal evaluation reports , 2020 quality assurance in distance education reports, ERT activity reports, and guides and survey results of the 14 institutions. The variety of documents accessed by the researcher were different depending on the institution.

Data Analysis

The data were first subjected to descriptive analysis and then to content analysis. *Descriptive analysis* refers to the summarization and interpretation of qualitative data according to the previously determined themes that form the conceptual framework of the research. The data summarized and interpreted by descriptive analysis are further deepened by content analysis. In content analysis, interrelated data is organized under certain themes (Baltacı, 2017; Guba & Lincoln, 1994; Pope et al., 2006; Yıldırım & Şimşek, 2011, p. 224). As such, the data obtained were first organized considering the themes of the research: the learner, the faculty, the course structuring, the teaching method, and the e-learning materials. Afterward, the data that were not related to the themes but were related to each other were gathered under certain themes. An additional theme, Traditional Education and ERT, was determined. Finally, content analysis further deepened the themes, and the data related to each other were gathered under subthemes. The participants' statements and the data obtained from the documents are presented with direct quotations. The code (F) for faculty members and the code (L) for learners are used in presenting the quotations. In addition, the institutions were coded as University 1 (U1), and so on.

Results

Based on the themes and subthemes that emerged as a result of the descriptive analysis and content analysis, the weaknesses in ERT are shown in Table 2.

Table 2

Weaknesses in Emergency Remote Teaching (ERT) According to Themes and Subthemes

1. Teaching method

Failure to adopt learner-centered approaches

- Failure to adopt learner-centered approaches by faculty member and staff
- Learners not thinking that they need to actively participate in online lessons.

2. Traditional education and ERT

Transfer of the traditional education problems into ERT

- Failure to adopt a learner-centered education approach in the traditional education system
- Failure to instill a learning culture in the learner
- Transfer of learner/faculty behaviors in traditional education to ERT (faculty who did not interact with learners in traditional education courses and learners with low learning motivation exhibited similar behaviors in ERT)
- Faculty lacking the ability to use the software/programs related to their major, lack of necessary equipment, and insufficient physical conditions based on the majors, even in traditional education

3. Learners and faculty

The absence of learners' and faculty's ODL readiness

Learners:

- Lack of motivation to learn (not taking lessons seriously with the feeling of being away from authority)
- Lack of self-regulation skills (attending online classes without creating healthy learning environment, engaging with extracurricular stimuli on the Internet, inability to sustain attention online)
- Lack of awareness of being a distance learner (not participating in asynchronous activities [discussion forums, etc.], not attending synchronous classes with the understanding that they can watch the course recordings later)
- Lack of scientific literacy skills (reaching and examining scientific publications)
- Lack of ability to take responsibility for one's own learning (prefer not to engage due to lack of authority)
- Lack of experience in distance education (being unfamiliar with the culture of distance education)
- Lack of technological competencies

Faculty:

- Lack of pedagogical competencies (increasing interaction in processes such as course presentation, content creation, assignment, enriching course presentation with various media)
- Lack of technological competencies (the need for information on software that can be used in distance education and the use of functional features of these software)
- As a result of the overall negative perception created by the lessons of instructors who do not have sufficient pedagogical and technological competence in distance education, the current ideal course environments are also negatively affected, and the instructors who are already highly motivated experience a loss of motivation as a result of the decrease in learner participation

Learners' failure to embrace distance education

- Belief that distance education cannot be efficient
- Lack of motivation for obtaining distance education proficiency as the ERT is seen as temporary

Failure to follow learners' progress

- Inability to track the extent to which learners have completed their course modules
- In order for the learners to appear as having watched the course, it is sufficient for them to just click on the relevant link in the system

4. Course structuring

Arbitrary learning–teaching practices

- The variability of educational practices depending on the instructor, the negative reflection of this complex process on the learners (some faculty deliver or do not deliver synchronous lessons, offer or do not offer asynchronous lesson materials)

Using a single mode of technology in the delivery of lessons

- Completely asynchronous structuring of courses due to reasons such as lack of technological infrastructure (learners without Internet access or institution without distance education infrastructure)
- Fully synchronous or completely asynchronous structuring of the course in line with instructor preferences

Failure to apply course designs in accordance with the philosophy of distance education

- Lack of modular course designs allowing the learner to progress at their own pace
- Online classes kept too short or too long

Failure to ensure course integrity due to the fact that the same course is taught alternately by different instructors (incompletely covered topics due to instructor switches)

Not presenting synchronous course recordings to learners in an organized manner

- Late or incomplete uploading of course recordings to the system

- Instructors who never upload their course recordings for personal reasons (copyright, arbitrary reasons)
- Not recording or uploading courses due to technical issues (the tools used do not offer free course recording, the speed of uploading to the system is slow)

Ineffectiveness of applied courses

- Ineffectiveness of the lessons requiring methods such as demonstration
- Inability to obtain efficiency in situations where physical intervention with the learner is required
- Not allowing learners to have sufficient practice time in the synchronous lessons where the show-and-make method is used
- No later makeup lessons for applied lessons that were not effective

5. E-learning materials

Negative consequences of policies related to the accessibility of e-learning materials

- The content for which access is limited to a semester cannot be revisited when needed
- Lesson participation in synchronous classes is lower when course recordings are offered without access restrictions

Insufficient variety of e-learning materials

- Misconception that the scope of asynchronous course material is limited to synchronous course recordings
- Lesson materials mostly limited to presentation/Microsoft Word formats
- Lack of instructor competence regarding the provision of rich media in the presentation of the content

Lack of sufficient discipline-specific, Turkish language–supported OER that instructors can offer learners

- Learning materials limited to presentations due to lack of OER

Note. ERT = emergency remote teaching; OER = open educational resources.

Teaching Method

Most of the learners and faculty stated that teacher-centered methods were used in the ERT process. In this regard, U6 F noted that "The philosophy of distance education was definitely not implemented, only distance education technologies were used." The U3's institutional internal evaluation report (2020) stated that "theoretical instruction, mostly in the form of instructor presentations, was applied as a teaching technique." Additionally, according to U14's online attitude evaluation report (2021), nearly half of the learners who answered the survey did not think that they should actively participate in online courses.

Traditional Education and ERT

Some learners and faculty stated that traces of the traditional education system were evident in ERT practices. For instance, U14 F stated that ERT shows them they failed to instill the culture of learning in

learners: “These 60 learners not attending online classes will be reluctant teachers in the future because we failed to instill the culture of learning in them. Online education has made that clear as well.” U13 F stated: “We still cannot model the constructivist approach in our system. We have observed a learner profile that repeats their offline behaviors in the online classroom.” U4 F noted that “the lazy [learners] will be lazy, no matter what, and the hardworking [learners] will be still hardworking. But you have to set up the online system. If you do not, eager learners will not learn online either.” In addition, U5 L stated: “We have shortcomings even in our face-to-face system. I do not have a studio in my cinema and television department and faculty who can use Adobe Premiere, or After Effects. Online learning is yet another set of problems.”

Learners and Faculty

Learners were observed to have various inadequacies in areas such as learning motivation, self-regulation skills, distance education experience, awareness of being a distance learner, being an independent learner, scientific literacy, and technological competence. Instructors were found to have pedagogical and technological inadequacies. U14’s survey form findings (2020) document reported that “the readiness levels of learners and faculty members are quite low due to reasons such as lack of equipment and tech skills, Internet shortage, and self-efficacy in learning.”

Regarding the low learner motivation, U11 L stated: “We were used to the comfort at the time. While we attended classes, some learners left in the middle.” In addition, U14’s distance education learner satisfaction survey results report (2020) stated that “learner responses about the courses show that they are negative about the effectiveness of distance education courses and unwilling to participate in them.”

Regarding the lack of self-regulation skills of the learners, U11 F stated: “They write that they are on the minibus right now and cannot answer. The learner should sit at the desk as if they were attending a regular face-to-face lesson.” As U1 L stated, “There is a bed on one side and food on the other. You can access other Websites as well. So, there is no motivation.”

Regarding being an independent learner and the distance education experience, U11 F stated: “Online education is still foreign to our culture. There are many learners getting online just to pretend to be participating in classes.” As U13 L stated: “We express our ideas more easily in face-to-face learning. Or we feel compelled to participate. We did not participate because there was no such obligation when it was remote.” U12 L added: “We were raised with traditional teaching methods throughout elementary, middle, and high school. When we started classes on such a [distance] platform, we were surprised at what happened.” In addition, as reported in U14’s online attitude scale evaluation report (2021), “25.77% of the learners answering the questionnaire stated that they could make up for the lessons they could not understand by themselves via online learning, while 46.84% stated that they could not.”

According to some participants, the awareness of being a distance learner was not at a sufficient level. U4 F stated the following:

> A group of instructors not knowing how to go about it were trying to support a group of learners not knowing what distance education is about, how to manage their time, access resources, prioritize courses, prepare for the exam, handle this job when they are by themselves.

U6 F stated: "While we were building the LMS [learning management system], we included discussion forums for each course, but they were not used much. Faculty members and learners did not seem to know the purpose of these" U6 L said: "Learners do not attend the synchronous class with the understanding that they can watch the recorded version of it later." In addition, the online attitude scale evaluation report (2021) of U14 stated that "21.68% of the learners answering the questionnaire think they are aware that they should come to the online lesson more prepared, while 49.2% do not think so."

Regarding the scientific literacy of the learners, U12 F stated the following: "I'm not sure about the learners' ability to read academic texts. Some of the prerequisite skills that they should have for distance education are critical. I don't think they have these skills." Additionally, U12 F stated that some learners did not have technological competencies: "There were many learners having trouble even getting on Google."

Some faculty stated that they did not have sufficient pedagogical competence in distance education. For example, U13 F said: "We need examples, models and impositions on how our existing course contents, teaching styles, or assignment styles can be enriched more interactively." As stated by U12 F: "The distance education process requires a different set of instructional competencies. All faculty members need training on learner participation, course presentation, and giving assignments in ODL."

Some faculty stressed that they lacked technological competence for distance education. For example, U14 F reported the following: "You do not know which program to use, the features of the program and you get stressed. It also affects efficiency." Some learner participants also stated that faculty did not have technological competence. For instance, U2 L noted: "I realized that the faculty did not understand much about technology in this period. There were people who couldn't even use a computer." In addition, U2's document about education monitoring and guidance commission decisions (2020) pointed out the deficiencies in the technological competence of the faculty:

> Instructors' inability to use Adobe Connect application effectively (not knowing how to transfer the image to the screen, activate learner voices and images, use the blackboard) to use the Learning Information System effectively (not knowing how to enter exam dates into the system, having problems uploading documents, failure to upload documents on time).

Furthermore, U3 F stated the following:

> A faculty member may be very enthusiastic, but if another faculty member does not know anything, the learner gets bored after a while, which has a demotivating effect, triggering learner absenteeism. When the instructor sees a decrease in the number of learners attending the course, the motivation of the eager faculty member also plummets. The management takes no steps in this regard either.

Some of the participants reported that learners did not adapt to distance education well. As noted by U5 L: "There is a problem with learners' acceptance of the distance learning method. The administration may have campaigns to encourage its use." U1 L made the following comment: "In our subconscious, we have the idea that distance education cannot replace face-to-face education. I don't think I can adapt to it." In addition, U2's document about education monitoring and guidance commission decisions (2020) reported

some sources of learner dissatisfaction with the ERT as follows: “Disliking and not embracing distance education, nor viewing distance education as a substitute for face-to-face education.”

U14 F stated that learners’ digital footprint could not be tracked during ERT: “I think most of the recordings are not watched by the learners because it was enough to click on the link to prove that they have watched it. If we had a minute-by-minute tracking system, it would be better.”

Course Structuring

The lessons were observed to be under-planned and arbitrarily structured. For example, U5 L made the following comment: “There were those who sent PDF, there were those who did not. There were those who taught live lessons, and those who did not. It wasn’t very healthy. It was completely personal.”

In the period of transition to ERT, there were institutions where the courses were structured completely asynchronously due to technological infrastructure inadequacies. For instance, U6 L said: “At the first time, I was at the point of dropping out of the course. It was always asynchronous. In the summer, the system became better.” U11 F stated: “As our learners do not have Internet access, we only held the lessons by uploading PDFs. But we have been running it through UZEP [LMS] for the last year.” In addition to these, U5 F pointed out: “At first, live lessons were not required, but later on, they became compulsory.”

Some faculty were observed to limit the presentation of the courses to the use of a single type of technology. As reported by U12 L: “We used to watch the videos shot before taking the exams. The instructor wouldn’t do the online sessions.” As in the words of U5 L: “There were those who taught live, and there were those who just uploaded PDF files. There were also those who sent both a PDF and lecture notes and gave live [lectures] at the same time.”

U14 L drew attention to the necessity of modular course designs that allow learners to progress at their own learning pace: “If the professors prepared all 12 weeks at first. Maybe I could finish the five-week course in one week and learn other things in my remaining time.” Additionally, some learner participants stated that some courses were too short or too long. For instance, U8 L stated that “some lessons were long. There were block lessons lasting 90 minutes.”

U4 L pointed out another matter: “In the same lesson, four or five faculty were teaching certain subjects alternately. When one of them left the subject incomplete, it stayed incomplete.”

Some participants stated that synchronous course recordings were not presented to learners in an organized manner. For example, U13 L noted: “It was said that the lessons were recorded synchronously, but they were added to the system too late. Or a certain part of it was missing.” U13 F, from the same institution, stated: “Some of the learners cannot find the courses of some weeks even this semester.” Additionally, U14 L noted the following: “Course recordings were not presented most of the time. Even if it was recorded, instructors could not upload the recording to the system due to upload speed and copyright problems.”

Other participants reported that synchronous course recordings were not presented to learners in an organized manner. As stated by U10 F: “Whether to record the lessons or not was up to us. It was not enforced or monitored.” U12 L stated: “Google classroom used to allow recording, and it was recorded on

Drive by faculty. It doesn't allow that anymore. It has become a paid one, and those who miss the online lesson cannot watch the recording again."

Some of the participants stated that the applied courses were not effective during the ERT. For instance, U9 F commented that "there were moments where we wanted to see the learner's hands-on application, and tell him that he was not doing it right, so the efficiency decreased." U6 L stated: "Our faculty were sharing screens in courses such as software and MATLAB. While listening to the lecturer, we could not work with him at the same time because we could not catch up." Regarding the compensation for the courses, U10 L noted: "While we should have learned the applied course on-site, we were taught theoretically, and it was inefficient. No compensation could be made because the time had passed." Additionally, according to U13's report on distance education satisfaction survey results (2020), 79.4% of the learners thought that distance education restricts learning applied courses.

E-Learning Materials

Some institutions had a limit on the period of accessibility of e-learning materials offered on the system, whereas some others did not impose a time limit. U9 L noted: "Semester courses are disappearing. I am very sad because quality contents suddenly vanishes." On the other hand, U14 F stated:

> I was putting a time limit on a weekly basis, then some students mentioned that they could only access the Internet when they go to the city because they live in the village. Then we removed this restriction. These course recordings also significantly reduced synchronous class participation.

Some learners stated that the e-learning materials presented in the ERT were insufficient. For example, U1 L complained: "The only thing we used was PowerPoint or Word. It was not enough." U4 L added: "We had difficulty in getting PDFs of some courses. They didn't upload it. Some just put videos without any PDFs. There were major shortcomings." In addition, U2's report on an education evaluation survey for 2019–2020 stated the following: "22% of the learners do not think that the teaching materials are sufficient and up-to-date." In the distance education evaluation survey report (2020) conducted in the same institution, the following was reported: "Another often-recurring negative theme is the inadequacy of distance education methods and materials."

Some faculty further stated that e-learning materials were mostly limited to presentations. U1 F stated that "the teaching materials were problematic. You can't teach a class just by preparing slides." U9 F noted: "We shared the PowerPoint presentations that we used in our earlier lessons. I can say that almost none of the faculty members used the e-learning materials that the learners could read and reflect about on their own."

One faculty member stated that instructors needed information on how to provide rich media. U13 F said: "We needed trainings on how to enrich the content." Another faculty member noted there was a misconception that the scope of asynchronous course material was limited to synchronous course recordings. U6 F stated: "Unfortunately, all the lessons were synchronous and their recordings were called asynchronous material."

U14 F emphasized the lack of open educational resources (OER): "Electronic contents such as video or Web pages is very insufficient in in the field of Special Education in Turkish language. Although I tried to show videos and share resources, they were in English, and the class do not know it well. So, you're left with PowerPoint presentations and your own lecture."

Conclusion, Discussion, and Implications

The results indicate various weaknesses involved in learning during ERT. Regarding ODL preparedness and distance education perceptions of learners and faculty, the findings in the current study show similarities to those found within the literature. For example, Valsaraj et al. (2021) found that most faculty felt they lacked the skills needed to deliver online education. Arayüz Kampanyası (2020) revealed that some instructors viewed the process as temporary and therefore had low motivation to teach through ERT. Song et al. (2020) showed that inexperienced instructors in online learning have knowledge needs regarding the use of online technologies and integrating asynchronous discussions into online teaching. Lassoued et al. (2020) found that reasons such as low motivation of learners toward distance education, faculty not believing in the effectiveness of distance education, reluctance to practice distance education, and learners' and instructors' inadequate technology skills are some of the obstacles to quality distance education. Additionally, other studies revealed learners had low motivation to learn in ERT, and they lacked planning and independent learning skills (Frangou & Keskitalo, 2020; Kaya & Işık, 2021). Some studies have found that to increase the readiness of learners for distance education, it is necessary to include activities that instill responsibility in the learner, such as assignments, small group discussions, or individual tasks (Kauffman, 2015; Tabor, 2021). According to the findings of the current study, some learners do not want to take responsibility and have low motivation to learn. Therefore, motivational factors that can enable learners to take responsibility for the ERT process should be considered.

Regarding the applied courses, Kaya and Işık (2021) revealed that learners could not acquire the skills in the applied courses in ERT, which caused them to feel inadequate. Lassoued et al. (2020) found that the difficulty of learning in some applied courses was considered an obstacle to quality distance education during the COVID-19 pandemic. In addition, some studies have suggested that clinical practices and laboratory courses in the fields of nursing and medicine could not be carried out effectively in ERT (Kürtüncü & Kurt, 2020; Mukhtar et al., 2020; Oliveira et al., 2021; Sarı et al. 2022; Sindiani et al., 2020). Regarding applied courses, the findings in the current study are generally similar to those of other studies.

In the context of structuring the courses and synchronous course recordings, which are other themes/subthemes of weakness, Arayüz Kampanyası (2020) showed that there were higher education institutions that limited the access of course recordings to a term, as well as institutions that imposed certain time limits. Some learners did not support the time limit because it restricted their ability to review. Some institutions offered course recordings late or not at all. Also revealed were various approaches to presenting lectures, such as synchronous classes, asynchronous course recordings, and document sharing only. Our research findings have similarities to above-mentioned findings of the study by Arayüz Kampanyası (2020). In addition, a finding of the present study—course recordings without access

restrictions reduce participation in synchronous courses—shows that the services offered cannot be properly used by learners.

Regarding course durations, Oliveira et al. (2020) reported that learners stated they were exposed to a too high cognitive load in ERT, and one of the reasons for this was the lectures delivered without a break. Mukhtar et al. (2020) found that learners considered limited attention span as one of the limitations of online learning. Similarly, the current study revealed that keeping online classes too short or too long is one of the weaknesses in ERT.

Regarding weaknesses in e-learning materials and teaching method, Schlesselman (2020) found that in ERT, faculty transferred their face-to-face courses online without any adaptation. The TÜMA report (Karadağ & Yücel, 2021, p. 15) states that most learner participants did not find the e-learning materials offered in ERT to be original or of high quality. Chierichetti and Backer (2021) revealed that what most instructors did in ERT was teach synchronous classes following the face-to-face schedule, using PowerPoint presentations in the lessons. This study shares similarities with the findings of mentioned studies in terms of insufficient variety of e-learning materials.

Regarding OER, O'Keefe et al. (2020) stated that in an emergency, there may not be sufficient time to create a rich online course environment, in which case, instructors can turn to existing OER such as COOL4Ed or MERLOT. However, the lack of sufficient Turkish-supported OER is one of the weaknesses identified in this study.

Another weakness revealed by the current study was the inability to track the extent to which the learners completed their course recordings and the fact that learners only needed to click on videos in the system to have it appear that they watched the course lesson. Some measures can be taken against these problems. For example, LMSs can statistically present how much of each video is watched, and the digital footprints of learners can be tracked by organizing asynchronous activities.

To conclude, higher education institutions are encouraged to consider the weaknesses in ERT revealed in the study and to create an action plan for ODL so that they are prepared for future crisis situations. Additionally, future studies using larger sample sizes, focusing on identifying weaknesses in ERT within the context of the other components of ODL, should be carried out.

Limitations

Some limitations in the present study include a small sample size and a limited variety of data sources. Even if the data were collected through interviews and documents, most data were collected through interviews. Therefore, the findings of the study may not be easily generalized.

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Book Review: Contextualised Open Educational Practices: Towards Student Agency and Self-Directed Learning

Editors: Jako Olivier, Charlene du Toit-Brits, Byron J. Bunt, and Amit Dhakulkar (AOSIS Books, 2022), ISBN: 9781779952653 (pdf). https://books.aosis.co.za/index.php/ob/catalog/book/345

Reviewed by: Carina Bossu, *The Open University*

Introduction

The book *Contextualised Open Educational Practices: Towards Student Agency and Self-Directed Learning* is a valuable resource for anyone interested in enhancing open educational practices (OEP) in various educational settings, in particular in open and distance learning. The book is edited by Jako Olivier, Charlene du Toit-Brits, Byron J. Bunt, and Amit Dhakulkar and was published in 2022 by AOSIS Books in Cape Town.

This volume is part of the North-West University (NWU) Self-Directed Learning Series. In it, the authors explore the application of OEP in enhancing students' agency and self-directed learning (SDL). The book is built on the premise that education needs to be relevant to the learners' context of learning. The authors argue that OEP provides learners with opportunities to co-create knowledge with their peers, learn at their pace, and leverage multiple sources of knowledge to contextualise their learning experiences. The book follows a unique format, exploring different aspects of the NWU OER Fellowship programme, which supported academic staff at NWU in developing diverse OEP projects and initiatives involving their students.

Book Structure

This book comprises 10 chapters, each exploring a different aspect of OEP in promoting student agency and self-directed learning. The first chapter is crucial for readers to understand the context of the OER Fellowship programme, as it offers an overview of the programme, its theoretical foundation, and the outline of the process followed. It includes qualitative analysis of perceptions about the initiative from the fellows themselves. The importance of positive interdependence within groups and the motivating effect of expert inputs and financial incentives are significant findings. Additionally, the responses from participants reveal unique methods of promoting student agency and implementing localisation, which are further explored in other chapters of the book.

Chapter 2 delves into the unique context of South Africa, focusing on multilingual digital education in higher education and its connection to social justice through localised self-directed OEP. The chapter begins with an overview of the broader multilingual context in South Africa and then clarifies the role

of OER and OEP in promoting social justice and opportunities for language harmonisation. In addition to providing a theoretical foundation for subsequent chapters on localisation, this chapter offers practical recommendations for implementing self-directed OEP in similar contexts.

Chapter 3 expands on the theoretical foundation of open educational resources (OER) by specifically examining their definition, the needs they address, the benefits they offer, and the challenges associated with their use, all while establishing a clear connection with self-directed learning (SDL). The chapter thoroughly explores the benefits that OER provides for students, highlighting the significance of initiatives like the NWU OER Fellowship and others that share a similar purpose. Through this literature review, several gaps and potential future research and development opportunities emerge regarding OER and its intersections with SDL. The chapter ends with some proposed solutions for practitioners and other stakeholders to overcome some of the challenges facing OEP.

Chapters 4 and 5 provide readers with practical examples of implementing OER initiatives, not only with a focus on SDL, but also with social justice at their hearts. In Chapter 4, the authors describe the process of creating a glossary within the realm of philosophy, translating its content into several South African languages, and subsequently sharing it. The authors also acknowledge the need to consider translation challenges, in particular standardized representations, and question the historical roots of certain concepts and dominant narratives. Chapter 5 explores the design of an OER as part of a technology-enhanced practice environment aimed at improving the oral competence of beginner French language learners. The motivation behind developing this OER, which involved creating open-source software, was the necessity to enhance oral communication skills in a foreign language, particularly given the limited classroom time and speaking opportunities typically available for foreign language learners. The chapter also outlines the various stages involved in developing a context-specific OER that adheres to sound instructional design principles and OEP.

Remarkable examples of OER co-creation are explored in chapters 6, 7, and 8. Chapter 6 reports on an empirical investigation of a project which involved the co-creation of an open textbook by a lecturer and their students, in an attempt to decolonise the journalism curriculum. This is an important example of how fostering SDL as part of an OEP project to create learning material can play a significant role in student agency and decolonising curricula. In Chapter 7, authors discuss the “Singing Feelings” project, which focuses on student-generated stories as OER. The project encourages students to create open educational music resources (OEMRs) centred around socio-emotional learning for an online platform. Adopting a qualitative narrative inquiry, authors suggest that through personal stories, meaningful learning experiences can be designed, raising awareness of the value of OER and promoting innovative opportunities for creating OEMRs, empowering student agency. Another example of learner co-creation of content and knowledge is explained in Chapter 8, which examines the perceptions of second-year health and social care students engaging with and developing OER in an interprofessional collaborative learning environment. The study aims to understand the use of OEP in collaborative learning settings. Findings indicate that OEP offers opportunities for applying knowledge, fostering cooperation and collaboration, and empowering students through the co-creation of knowledge as OER. The study also identified some challenges that can inform future similar OEP initiatives.

Chapter 9 explores a project in health and focuses on the development of an OER as a tool for raising awareness of infectious diseases, particularly HIV/AIDS, tuberculosis, and COVID-19. The chapter discusses the gap between information and understanding in these areas and explores the role of OER, specifically open education games, in creating awareness. The final chapter examines how decolonial

practices can contribute to researching OER and developing open legal pedagogies from a South African perspective. It discusses epistemic injustice as a central issue in decolonising the curriculum and emphasizes epistemic justice and access to open legal education. The chapter proposes a framework for an inclusive learning environment using a decolonial approach with OER and OEP. It also addresses teaching and student agency within a South African university and concludes with a discussion on OER as a tool for social justice and its role in developing open legal resources and pedagogy.

Significance

This book explores key OEP initiatives supported by the NWU OER Fellowship programme. The Fellowship programme itself is innovative and a strategic way to build capacity in and encourage university educators to engage with OER and OEP, as suggested by previous research in the field (Bossu, Brown, & Bull, 2014). The OER Fellowship programme is a commendable institutional-wide initiative, and I hope more institutions will follow NWU's lead. By developing a book about some of the Fellowship initiatives, NWU gives readers an overview of what can be achieved and how students can benefit from OEP engagement, including co-creation of knowledge and promotion of self-directed learning. The book is a valuable resource for educators, educational researchers, and policymakers who want to promote self-directed learning and OEP. It offers practical examples and theoretical insights into how OEP can be implemented in various educational contexts, in particular in open and distance-learning contexts.

References

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Book Review: Co-teaching and Co-research in Contexts of Inequality: Using Networked Learning to Connect Africa and the World

Editors: Phindile Zifikile Shangase, Daniela Gachago, and Eunice Ndeto Ivala (Vernon Press, 2023, xxxvi+275 pages). https://vernonpress.com/book/1767

Reviewed by: Tony Carr, Centre for Innovation in Learning and Teaching, Centre for Higher Education Development, University of Cape Town, South Africa

Introduction

This book seeks to address the paucity of literature about networked co-teaching and co-learning in the contexts of inequality, and specifically in the African contexts, including cross-continental collaborations. In doing so, it also considers the challenges of co-researching. The call for chapters was circulated just before the COVID-19 pandemic, and the chapters were written at the height of the pandemic. Three of the chapters explicitly consider the design of responses to the pandemic.

The editors describe co-teaching and co-research as "teaching and research that connects educators and learners across different institutions and different contexts, be it across South Africa, Africa, or the world" (p. 1). One of the key insights shared by the editors and several of the authors is the critical importance of human connection and relationship building to successful co-teaching, co-learning, and co-researching. Another interesting feature of the book is the thread of digital storytelling which runs through many of the chapters.

The authors present a rich selection of "compelling cases for engaging in co-teaching and/or co-researching to advance more socially just, supportive, and mutually favourable practices in HE, among local and international academics and their students as well as practitioners" (p. xxxv). The editors are based in three South African universities with very different histories, cultures, and resourcing, and the international group of over 40 authors comes from Australia, Brazil, Egypt, Kenya, New Zealand, South Africa, Uganda, the United States, and the United Kingdom. I have known of the excellent and pathbreaking work of many of the authors for several years through the e/merge online conferences and the e/merge Africa professional development network. I believe this provides me with useful knowledge of the context of many of the authors (as well as a small bias in their favour). The text will be of particular relevance to colleagues interested in teaching, learning, and research collaborations in contexts of inequality due to the "cornucopia of international, transcontinental, pan-African, inter-institutional, institutional, and university-industry cases" (p. xxxv) and theoretical frameworks used by the authors.

Organization/Structure

After the foreword by Cheryl Hodgkinson-Williams and the introduction by the editors, the book has two sections. I will describe these in turn and spotlight three chapters along the way to give a sense of the range of contexts and theoretical framings.

Section 1, entitled "Connecting Africa through Co-teaching and Co-research," consists of six chapters focused on co-teaching, co-learning, and co-research in African contexts. Five of these chapters are based in higher education, including one that features university-industry collaboration for innovation and transformation in architecture education. One of these chapters is dedicated to a thorough literature review of the use of technology in co-researching higher education. The sixth chapter features co-research and co-teaching in community-based adult education.

"Enabling Inter-institutional Co-design and Co-facilitation of a Postgraduate Diploma Module in Educational Technology: Uncovering Sites of Struggle, Negotiation, and Accommodation among Course Facilitators" (Chapter 2) is by Sonja Strydom, Simone Titus, Faiq Waghid, and Daniela Gachago from the four universities in the Western Cape in South Africa. Margaret Archer's analytical framework of structure, culture, and agency was used to analyse the written reflections of facilitators and transcripts of their reflective conversations about negotiating the challenges faced in developing a learning-centred curriculum for students from all four institutions, given inequalities between the institutions and their student bodies. The success of the collaboration by the diverse team required "a reflective process of negotiation" (p. 33) and a conscious effort to provide "support for the less powerful, or previously less included voices, whether those of facilitators or participants" (p. 32).

"Exploiting Technologies in Networked Designing, Training, and Research Engagement in African Universities: A Case of the Partnership for African Social and Governance Research" (Chapter 6) was written by Pauline Ngimwa of the Partnership for African Social and Governance Research (PASGR), Kenya, Proscovia Ssentamu from the Ugandan Management Institute, and Connie Nshemereirwe from Actualise Africa, Uganda. This chapter explores the use of technologies "to link African and international scholars in public policy and research capacity building" (p. 90) and discusses challenges faced in "connecting virtually on various designing, training, and research projects across different contexts, cultures, and technological capacities, and the strategies utilised in mitigating the attendant intricacies" (p. 90). Three key lessons from the analysis which drew on Bower's affordance analysis methodology and Sharples' generative framework are the advantages of working with technologies already in use by learners and teachers; the capacity building requirements and processes for effective technology integration; and that "training opportunities, staff exchange, and mobility opportunities are powerful motivators in supporting growth and developing a sense of ownership" (p. 105) in online communities of practice.

The six chapters in Section 2 entitled "Connecting Africa and the World through Co-teaching and Co-research" focus on collaborations between African institutions and partners in other continents, and foreground power dynamics resulting from inequality. While most of these chapters feature collaborations based in African higher education, one chapter zooms in on a case of co-creation of social change in Kenya which used mobile technologies for digital storytelling. Another chapter in Section 2 considers how to optimise online cross-cultural research collaboration.

In "Participatory Action Research in Digital Storytelling: Using Mobile Technology to Co-create Social Change in Kenya" (Chapter 12), Antonia Liguori, Melaneia Warwick, and Michael Wilson from

Loughborough University, United Kingdom, in partnership with Daniel Onyango from Hope Raisers, Kenya, reflect on the process and outcomes of the "partnership between Hope Raisers, a youth-led NGO based in Korogocho slum in Nairobi, Kenya, and the Storytelling Academy at Loughborough University" (p. 221) in the UK to use digital storytelling as "a tool for participatory action research (PAR)" (p. 221) to support the development of community-led solutions to the challenges faced by a community living in a slum next to a large dumpsite. The project required "mutual respect for each other's expertise and knowledge, whether acquired through a background in university research or gained through a life lived in the Nairobi slums" (p. 234). The conclusions included the potential for transformative and empowering use of accessible technologies and the wealth of local knowledge and expertise that community activists brought to the collaboration.

In the afterword on research collaboration, Maha Bali asks the reader to engage with the "work of peers undergoing similar endeavours and sharing their learning, their challenges, and their triumphs" (p. 265) so that we can ask ourselves what messages resonated for us and how might we approach collaboration in future. The variety of narratives, contexts, and theoretical framings in this book, together with a shared passion and endeavour for teaching, learning, and research in contexts of inequality where quality requires social justice, elicits such empathetic, self-reflective, and creative responses by the reader. This book lives in a universe replete with multiple stories, voices, and analyses. The conclusions are for each reader to draw.

Significance of the Book

African educators, researchers, and institutions are increasingly exercising full agency to claim their place as actors and innovators in our digitally interconnected world. *Co-teaching and Co-research in Contexts of Inequality: Using Networked Learning to Connect Africa and the World* contains fascinating stories and analysis of vibrant teaching, learning, and research networks within and between institutions, across Africa, and between continents. This book makes a valuable contribution to conversations about praxis which integrate research, practices, technology, and the social and institutional contexts of teaching, learning, and research in a networked world. The engagement with innovation in the contexts of inequality and resource constraint is of vital interest to practitioners because application in such contexts is a real test of the robustness and flexible design of an innovation. While several chapters provide excellent cases and analyses of innovation in distance learning, most of the authors step beyond the frame of distance learning when they focus on co-researching practices, cross-cultural collaboration, blended or face-to-face learning contexts, or community-based learning. The book will be of interest to colleagues who are focused on networked teaching, learning, and research collaborations in contexts of inequality and resource constraint, within and beyond developing world contexts (given the stark inequalities in many so-called developed countries). Case studies from the book will also be very useful in the teaching of interdisciplinary courses on networked teaching, learning, and research which are focused on social justice. The rich variety of research designs, theoretical framings, and case studies provided by the authors is also likely to provide a very useful resource for postgraduate students and many more experienced researchers.

Overall Impression

Due to the wonderful diversity of the contributions, the reader will not find a unified text with a systematic argument and a consistent theoretical base. The strengths of the book derive from the excellent work by the editorial team to recruit and collaborate with authors from several overlapping communities of practice; their curation of a rich text with multiple voices, contexts, stories, and theoretical approaches; and the authenticity, integrity, and rigour achieved collaboratively by the authors of each chapter. The book also showcases work from the maturing community of African researchers who are focused on the investigation of teaching, learning, and research supported by a range of technologies.

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Book Review: Blended Learning Environments to Foster Self-Directed Learning

Editors: Christo van der Westhuizen, Mncedisi C. Maphalala, and Roxanne Bailey (AOSIS Books, 2022, 306 pages)
ISBN: 9781776342419 (pdf). https://books.aosis.co.za/index.php/ob/catalog/book/366

Reviewed by: Ramiz Ali, University of Wollongong, Australia

Blended Learning Environments to Foster Self-Directed Learning is the eighth book in the Self-Directed Learning Series by North-West University, South Africa. The volume provides strategies and approaches to promote self-directed learning (SDL) in blended learning environments, featuring contributions from authors experienced in active learning strategies in online and blended learning contexts. They emphasise the importance of technology-enhanced learning, particularly blended learning, in improving students' overall learning experience by promoting SDL. The book, which is licensed for free use, consists of 10 chapters that delve into various pedagogical methods to enhance SDL in blended learning contexts. The target audience for this book is scholars and practitioners who are interested in enhancing SDL, specifically in blended learning environments.

The book begins by setting a theoretical foundation for the subsequent chapters. In Chapter 1, van der Westhuizen and Bailey highlight the importance of aligning the person-process-context (PCC) model with the Community of Inquiry (CoI) framework to guide SDL. In this chapter, the authors propose a model for SDL and make a case for combining PCC and CoI to create optimal learning experiences for individuals in blended learning environments. This approach was quite effective in shaping the overall logic of the subsequent chapters. In Chapter 2, Kruger and colleagues offer a literature review to conceptualise inquiry-based, blended, and self-directed learning, and they elucidate the connections between these three learning approaches. Although this chapter is consistent with the book's overall theme and focus, it places particular emphasis on the affective domain of learning. The authors argue that the affective domain is a shared element among all three learning approaches and could serve as a catalyst for enhancing self-directed learning in online and blended learning settings.

In Chapter 3, Bailey and Breed delve further into pedagogical strategies to improve self-directed learning. They adopt the flipped learning method (as a blended approach) combined with cooperative learning to improve SDL in blended learning environments. The authors found that the use of metacognitive questions and cooperative learning, in the form of pair problem-solving, could offer students valuable opportunities to regulate their learning goals, leading to positive learning outcomes. This finding is interesting because the implementation of these pedagogical strategies could not only promote students' self-directed learning abilities but also cultivate crucial metacognitive skills such as critical thinking, problem-solving, and self-monitoring and evaluation.

In Chapter 4, Kemp and van der Westhuizen explore the use of computer-aided design and learning management systems to facilitate self-directed learning in an engineering graphics and design course offered in blended mode. The authors explain how the use of these technologies can encourage students

to take initiative and responsibility for their learning. In Chapter 5, Maphalala and Mahlaba discuss how blended learning can promote SDL in higher education, particularly during the COVID-19 pandemic. The authors describe how the face-to-face component of blended learning can ease many challenges faced by students in online learning environments and enhance self-directed learning abilities, such as taking responsibility for learning, setting learning goals, and collaborating with peers.

In Chapter 6, Lotz and colleagues examine the potential of the flipped classroom approach as a form of blended learning to support metacognition and self-directed learning skills. They argue that if the approach is implemented effectively, it can foster these skills in students. In Chapter 7, Dhlamini investigates the readiness and flexibility of teachers to use blended learning and highlights the crucial role of teacher readiness and flexibility in technology use for effective blended learning implementation. Although this chapter emphasises the importance of flexibility, it could have been more focused on promoting SDL in the context of blended learning, which is the central theme of the book.

Chapters 8 and 9 present case studies that illustrate effective pedagogical practices for improving self-directed language learning in blended learning environments. In Chapter 8, Olivier and colleagues examine SDL in blended learning environments from the perspectives of *Sesotho sa Leboa* and *isiZulu* language modules, while in Chapter 9, Werlen and colleagues emphasise the significance of suitable online tasks in promoting students' SDL abilities within blended learning. Although both studies are context-specific, they offer distinctive viewpoints on how blended learning can be used to enhance SDL. In the final chapter of the book, Chapter 10, Bunt and van Deventer explore how blended learning and gamification can improve students' self-directed learning skills. Their study specifically focuses on the use of gamification to increase student engagement in blended learning environments, which can, in turn, facilitate the development and refinement of SDL abilities.

Blended Learning Environments to Foster Self-Directed Learning explores SDL in blended learning contexts from different angles. It covers a wide range of subjects, including the conceptualisation of SDL and blended learning, as well as pedagogical methods such as the flipped classroom and cooperative learning, and academic disciplines such as language learning, engineering, and education. Even though most of the studies featured in the book are small-scale case studies, they all contribute to the book's main theme and present some unique aspects or strategies for enhancing self-directed learning in blended learning environments.

The book contributes to the current scholarship on technology-enhanced learning, particularly in the area of blended learning, which has become a popular mode of delivery in recent years. The pedagogical approaches and technological solutions presented in the book could be beneficial for educators and higher education providers seeking to optimise learner engagement by improving students' self-directed learning abilities. This is especially important in the post-COVID-19 era, where education providers continue to explore avenues for improving student experiences amid rapidly changing teaching approaches. It should be noted, however, that the pedagogical practices presented in the book are context specific and may further modification or refinement to be successfully applied in other blended and online learning environments.

Overall, *Blended Learning Environments to Foster Self-Directed Learning* offers unique perspectives for improving SDL through blended delivery. The book provides a comprehensive examination of the topic, with a range of case studies and theoretical frameworks presented by experienced practitioners in the field of technology-enhanced learning. As such, it would be a valuable resource for scholars,

educators, instructional designers, educational leaders, and others interested in using technological innovations in education, particularly blended learning in higher education.