Introduction to the Special Issue: Highlighting AERA's Online Teaching and Learning SIG 2022

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The American Educational Research Association (AERA) is a research society that "strives to advance knowledge about education, to encourage scholarly inquiry related to education, and to promote the use of research to improve education and serve the public good" (2022). The association aims to encourage educational research studies and promote the practical implications of research findings. With 12 divisions and more than 150 special interest groups (SIGs), AERA provides advanced information to generate connections across practitioners, the field's leading researchers, and policymakers. AERA includes more than 25,000 members from 85 countries, including faculty, researchers, evaluators, graduate students, university deans, research directors, and higher education administrators.

In 2022, the AERA annual meeting was both place-based in San Diego, California, and virtual, with the theme of "Cultivating Equitable Education Systems for the 21st Century". As an influential special interest group (SIG) of AERA, the Online Teaching and Learning (OTL) SIG provides 200-plus members an informative platform to discuss and disseminate challenges and possibilities relating to online learning and teaching. For more information on OTL visit http://www.aera.net/SIG035/Online-Teaching-and-Learning-SIG-35.

SIG OTL and the Online Learning Consortium (OLC) have maintained a long-standing collaboration to advance the theory and practice of online, blended, and digital learning. Since 2016, the *Online Learning* journal (OLJ), the official journal of OLC, has released a special issue to extend opportunities for SIG OTL members to contribute their expertise in online education research. The 10 papers selected for this issue represent diverse voices of educators and professionals sharing rigorous research and innovative topics using an array of research methods. They are arranged into three major categories: students' cognitive and behavioral strategies in online environments; theoretical and practical implications of online learning and community; and students' online learning experiences.

The first category of articles includes two studies focused on learners' cognitive and behavioral strategies in online learning. In "Teachers' self-directed online learning strategies and experiences: A longitudinal study," Pamela Beach, Elena Favret, and Alexandra Minuk examined cognitive and behavioral strategies elementary teachers used in a series of self-directed online learning sessions and whether these strategies changed over time. Data were collected from 12 elementary teachers with navigation captioning, think-alouds, and semi-structured interviews. The authors found that participants demonstrated four main cognitive strategies: meta-cognitive awareness, monitoring learning, evaluating information, and increases in self-efficacy. Several behavioral strategies were also adopted during the learning process, with notetaking and video viewing being the most frequent, followed by using web features, exploring information, and changing courses. Their results suggested that participants monitored their

learning during their navigation. The findings provided implications for online learning module developers and organizations interested in designing online professional development for educators.

In the next study, "Scaffolding a culminating assignment within a community and task-based MOOC," Rebecca M. Quintana and Jacob M. Aguinaga, explored how scaffolds within a digital workbook could facilitate self-directed learning for learners completing a final project within a community and task-based MOOC. They explored the use of a digital workbook as an articulation and reflection scaffold in a MOOC course. They collected data from 77 assignments submitted during the four months of the MOOC and found that for some learners, a high level of workbook use corresponded to high quality written assignment responses. This study demonstrated that articulation and reflection scaffolds can be effectively integrated into learning sequences, providing directions for educators and designers to further refine the practice of facilitating self-management and self-monitoring that promote self-directed learning in a MOOC context.

The second category of articles focused on online learning and community, the first using Rovai's conceptualization of classroom community and the second using the Community of Inquiry (CoI) framework. In "Classroom community and time: Comparing student perceptions of classroom community in traditional vs. accelerated online courses", Patrick Lowenthal and Jesús Trespalacios explored student perceptions of classroom community in accelerated online courses (e.g., 7-week courses) compared to traditional length online courses (e.g., 15-week courses). The authors questioned whether accelerated courses require instructors and students to dedicate more time to the course, which in turn could help speed up the building blocks for a sense of classroom community to emerge. Moreover, the results showed that well-designed courses and skilled facilitation were more important than course duration in developing a sense of community. Their findings further revealed that every student found the importance of developing a sense of classroom community differently.

Then in "Relationship between metacognition and online community of inquiry in an online case-based course", Ayesha Sadaf and Stella Kim explored students' perceived metacognition (self-regulation and co-regulation) in relation to the social, teaching, and cognitive presences within the community of inquiry (CoI) framework in a graduate online case-cased instruction (CBI) course. According to their results (n=47), students perceived cognitive presence was higher and less variable among three online presences and metacognition in online CBI. The correlation between the two interdependent dimensions of metacognition (self-regulation and co-regulation) was significantly high. Additionally, social presence demonstrated the strongest association with both self-regulation and co-regulation, followed by cognitive presence. Their study made a huge contribution in exploring relationships between students' perceived metacognition and the CoI presences in an online CBI scenario. It also shed light on emphasizing collaboration in the CBI course and encouraging students to be aware of others' metacognitive thoughts in addition to their personal reflections.

Then in "The use of community of inquiry framework-informed Facebook discussion activities on student speaking performances in a blended EFL class", Mohammad Shams Ud Duha, Jennifer C. Richardson, Zohur Ahmed and Fahmida Yeasmin examined the use of community of inquiry-informed Facebook discussion activities on the speaking performances of undergraduate students in a blended EFL class in Bangladesh. They found a statistically significant difference between the initial and post-test speaking scores between the two conditions. Although there was no difference between the experimental and control groups, the

instructor's comments and interview data showed that Facebook was beneficial for both groups in improving students' speaking performance. This study informs the application of the CoI framework on a social media platform and provides further suggestions to instructors on how to use social media platforms to facilitate discussion activities considering the CoI framework.

The final article in this category is "The impact of multimodal communication on learners' experience in a synchronous online environment: A mixed-methods study" by Ying Cai, Zilong Pan and Min Liu. The authors investigated how multiple modes (visual, bodily, behaviors, spoken language, and written language) in synchronous online learning impact students' learning experiences from the perspective of social and teaching presence. The study invited 243 undergraduate students to complete survey (survey questions were designed to measure social presence, teaching presence, perceived effectiveness of available modes, and satisfaction with synchronous online learning), and 7 of them participated the follow-up interviews. Their results showed that written and spoken languages were the most effective modes of online communication, and the four modes were also significantly positively correlated with social presence, teaching presence, and students' satisfaction. This study has implications for course instructors and designers in effectively adopting different modes in synchronous online environments and promoting social and teaching presence.

Finally, four studies examined students' online learning experiences from the aspects of social interaction, learning formats (e.g., synchronous, and asynchronous), emotional distress, and international students' learning experiences. In the article "Comparisons of synchronous and asynchronous discussions in an online roleplaying simulation to teach middle school written argumentation skills," Jeremy Riel, Kimberly A. Lawless, and James B. Oren investigated how different degrees of synchronous and asynchronous online social interactions influent student achievement in written argumentation skills in the context of an online educational simulation game (ESG) called GlobalEd (www.globaled2.com). This study involved 46 middle school teachers from social studies and 896 students who were divided into three degrees of interactions (2 scheduled live conferences, 1 scheduled live conference, and asynchronous-only interactions). Their findings showed each condition yielded a moderate effect size. Particularly, "mid-range" (1 live conference condition) exhibited the greatest effects for student achievement in argumentative writing skills. These results provided evidence that asynchronous discussion could be feasible and effective for creating socially intensive online space. Nevertheless, combining synchronous and asynchronous interactions based on available resources and feasibility can maximize social presence,

In the next study, "Student webcam behaviors and beliefs: Emergent norms, student performance, and cultural differences" by Vanessa Dennen, Yasin Yalcin, Jaesung Hur and Bruce Screws, the researchers investigated students' perceptions of synchronous learning (SL) and webcams in terms of the relationships to achievement and behaviors. Additionally, they explored cultural factors that potentially impacted on students' SL behaviors. The study involved 2298 participants from the United States (n=408), Turkey (n=925), and South Korea (n=965). The results showed practices and beliefs surrounding webcam use differed by cultural background, academic achievement, and preferred seating in the face-to-face classroom. Being aware of the differences is valuable for educators in designing and teaching cross-cultural synchronous courses. The study provided some insights into student comfort of SL. It also enabled instructors to evaluate the situational nature of using SL tools in online classes.

In the article, "How online learning readiness can predict online-learning emotional states and expected academic outcome: Testing a theoretically based mediation model," Hsiang-Yu

Chien, Yu-Chen (Jenny) Yeh and Oi-Man Kwok focused on how emotional distress related to online learning readiness and academic outcomes. By using k-means cluster analysis (n = 80), they found learners with high level of online learning readiness showed significant differences from the low level online learning readiness group on anxiety, boredom, and satisfaction. A structural equation modeling (SEM) test result also revealed that readiness positively predicted satisfaction; satisfaction predicted learning expectations and expected grade. The main takeaway from this study was that understanding students' online readiness, providing timely support, and paying attention to students' emotions were critical factors to consider in online teaching.

In addition, in Katie K. Koo and Mei Jiang's article, "What does it mean to take online classes as an international student during COVID-19? the researchers investigated international students' experiences, challenges, and perceptions of online learning environments during the COVID-19 pandemic by using the Theory of Social Support and the Community of Inquiry as theoretical frameworks. By conducting three virtual focus group interviews with 18 international students, the authors concluded that the main challenges that international students met during the pandemic were: social isolation in online learning spaces; difficulties with engaging in online class discussions and activities; limited opportunities for improving English proficiency in the online setting; and limited academic support from faculty and advisors. The findings offered insights and implications for institutions and faculty in establishing appropriate support systems for international students.

Our sincere gratitude goes out to the OLJ managing editor Mary Rice, editor-in-chief Peter Shea, OTL SIG chair Ana-Paula Correia and all the authors. We hope you'll find these articles as enlightening and informative as we did.

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Reference

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Teachers' Self-Directed Online Learning Strategies and Experiences: A Longitudinal Study

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Abstract

This study examines the strategies used by teachers during a series of self-directed online learning (SDOL) experiences. Over a period of four months, the authors met with 12 practicing elementary teachers three separate times. During the meetings, the teacher participants informally used the internet for their professional learning in literacy. Their online navigations were captured using screen-recording software. Immediately following their navigations, a virtual revisit think aloud was conducted where participants verbalized their thoughts aloud while viewing a screen-recording of their navigation. Semi-structured interviews with each participant were conducted following the three meetings. Data were analyzed both qualitatively and quantitatively. Findings relate to the cognitive and behavioral strategies in which participants engaged during their SDOL experiences.

Keywords: teacher professional learning, self-directed learning, online learning

Teachers are increasingly turning to online environments for their professional learning (Parsons et al., 2019). Their use of online platforms makes sense since online environments provide teachers with spaces where they can engage with a multitude of teaching material and collaborate globally to gain insight into educational issues and best practices (Macià & García, 2016). Informal online learning opportunities are particularly conducive to teachers' schedules, allowing for flexibility with respect to time and geographical location. While a plethora of research has documented how teachers engage in formal online learning (Lantz-Andersson et al., 2018), less is known about teachers' self-directed online learning (SDOL)—teachers' decision-making processes and learning behaviors that occur during informal online navigations (Beach et al., 2021a). Moreover, limited research has documented teachers' SDOL over time. Given the impact professional learning can have on a teacher's beliefs and practices (de Vries et al., 2014), it is critically important to the teaching profession to understand how and why teachers select and use online resources and websites to inform their professional learning.

To best understand the *how* and *why* of teachers' SDOL, it is essential to use methods that capture teachers' cognitive processes and behavioral patterns as they occur. As such, this study used the virtual revisit think aloud to examine the strategies used by elementary teachers during a series of SDOL experiences. This work builds on a pilot study (Beach et al., 2021b) and presents a comprehensive picture of elementary teachers' online learning experiences and strategy use over a sustained period. Understanding the strategies used by elementary teachers during SDOL facilitates better decisions about and increased quality of informal online learning opportunities for teachers. Our findings also confirm that the virtual revisit think aloud can provide moment-to-moment data about online learners' strategies and behaviors during SDOL.

We begin this article with a review of the related literature on teacher professional learning. We then provide a discussion of self-directed learning, the theoretical framework for this study. The article continues with an overview of the methodology, including a more detailed discussion of our main data source, the virtual revisit think aloud. This is followed by the results and a discussion of the findings.

Review of the Related Literature

Like their students, teachers should be given access to a variety of learning opportunities. Providing teachers with choice in their learning can lead to increased engagement and a greater possibility of knowledge application (Campbell et al., 2017). Approaches to teacher professional learning can fall on a continuum. On one end of the continuum, more formal opportunities like distance education courses, are often guided by a facilitator and usually revolve around a community of teachers who all share a common goal (Jurasaite-Harbison & Rex, 2010). These types of learning approaches are often "top-down professional development endeavors, initiated by schools, districts and government agencies" (Lantz-Andersson et al., 2018, p. 304). At the opposite end of the continuum are informal approaches to learning, like a hallway conversation initiated by a colleague who has a particular question about a topic of interest. These types of learning opportunities can be described as bottom-up approaches (Lantz-Andersson et al., 2018) and are unique to each teacher; learning opportunities are personalized since the individual seeks out information with a particular goal in mind (Callanan et al., 2011).

Regardless of where an approach might fall on the professional learning continuum, opportunities for learning should incorporate research-based content, and be collaborative and job-embedded (Darling-Hammond & Richardson, 2009). Learning should also be supported,

sustained, and self-directed (Darling-Hammond & Richardson, 2009). When these key elements are taken into consideration, there is a greater likelihood that teachers will become engaged in their learning and incorporate new information into their instructional planning, ultimately leading to increased student achievement (Trust & Prestridge, 2021). For instance, Owen (2015) found that collaboration between colleagues during a professional learning community provided opportunities for co-planning, co-teaching, and co-assessment, and an increase in teacher support. Exploration of new teaching practices and reflective dialogue were also reported.

Similarly, in a study that involved peer coaching during context-embedded professional learning experiences, Bruce et al. (2010) found that collaboration over a sustained period of time led to increased confidence in participants' abilities to support their students and take greater risks in their instruction. The authors suggest that sustained, collaborative, and classroom-embedded professional learning opportunities support effective professional learning and lead to student achievement gains as well as gains in teaching quality (Bruce et al., 2010). Moreover, Alshaikhi (2020) found that teachers showed a high preference for self-directed learning (SDL) over more traditional forms of professional development. The SDL in which Alshaiki's participants engaged was both collaborative and individualistic. Alshaikhi (2020) noted that their participants felt driven to self-direct their learning since this approach provided an immediate response to their needs.

In online environments, teachers have many varied opportunities for learning and professional growth (Elliott, 2017). Many studies have examined the key elements listed above in the context of online environments. For instance, Colwell and Hutchison (2018) examined how a Twitter-based professional learning network offered preservice teachers a collaborative space where they were able to develop their understanding and perceptions of disciplinary literacy. The authors describe this informal online learning space as a type of professional learning that provides teachers with ongoing opportunities to discuss and share resources efficiently and with a network of educators that transcends teachers' local community (Colwell & Hutchison, 2018). Online sharing platforms, like Twitter, can allow teachers to gather and share advice, links, relevant resources, and timely news. By following other educators on social media platforms who all share common interests, teachers can find resources, learn about new approaches, and inquire about educational issues in a relatively short timeframe (Colwell & Hutchison, 2018).

In all these examples, there are underlying cognitive processes at play that guide and influence a teacher's decisions, beliefs, and goals during their professional learning. These cognitive processes can range from more complex and higher order processes to more procedural in nature (Horz & Schnotz, 2010). Higher order cognitive processes might involve reasoning, monitoring, and evaluating, to name a few, whereas procedural or lower order processes can refer to merely describing an event (Horz & Schnotz, 2010). The study of teachers' cognitive processes has primarily focused on the interactions between teachers' cognitive constructs and their classroom practice. For instance, Peters-Burton and Botov (2017) examined how elementary teachers engaged in a professional learning activity. They found that their participants monitored their learning in regular periods to see if their goals were being met. Monitoring learning involved skimming and scanning information for relevance and self-assessment using questions.

Additionally, in their study examining preservice teachers' cognitive processes during reading instruction, Griffith (2017) found that their participants used metacognitive decision-making strategies to reflect on their teaching growth and identity. Griffith's findings show that

these types of in-the-moment learning strategies allow teachers to draw upon their content and pedagogical knowledge to best support their students during learning activities.

Recognizing and understanding underlying cognitive processes and learning strategies is essential for professional learning to be successful, whether the professional learning is formal or informal. One type of informal learning that has become increasingly popular amongst teachers, particularly during the COVID pandemic, is SDOL (Beach et al., 2021b). SDOL stems from theories related to SDL, a complex process of independently seeking out and acquiring knowledge (Garrison, 1997). Connected to Knowles' (1975) adult learning theory and emerging from the notion that individuals often desire to understand a phenomenon, an incident, or a concept (Ponti, 2014), SDL is a highly individualized process with underlying supports in constructivism, an educational theory that emphasizes knowledge and understanding as based on a learner's own experiences. When involved in SDL, the learner constructs and reconstructs knowledge based on their own interpretations of information (Simons, 2000). SDL is a self-initiated process of learning, fosters personal autonomy, and promotes greater learner control; learners are free from external control and constraint (Caffarella, 1993). According to Trotter (2006), teachers are self-directed learners when they choose educational topics that directly relate to their individual practice and classroom context.

Several processes are involved during SDL including self-management, self-monitoring, and motivation (Garrison, 1997). Self-management focusses on task control and the ability to be metacognitively aware; the learner is intentional and aware of their task-oriented goals. The focus is on what the learner *does* during the learning process and the strategies they enact to accomplish a particular task. Managing a task during the learning process is dependent upon several variables (Garrison, 1997), including proficiency (the learner's abilities and skills), resources (the support and assistance in the given learning environment), and interdependence (the learner's integrity and choice). Additionally, it is through reflection and critical awareness that a learner is metacognitive and able to effectively self-manage their learning; an internal dialogue occurs during the learning process in which the learner is aware of their current knowledge, how they will search for additional information, and assess their learning outcomes. In an online environment that is geared towards self-directed learners, such as a professional development website (e.g., www.readingrockets.org), a teacher might manage their learning by selecting a tutorial video that can help them effectively use a new learning tool (proficiency), using filters during a search (resources), and initially navigating a website that provides them with multiple forms of media from which to learn (interdependence).

Self-monitoring involves planning and modifying our learning as the process progresses (Garrison, 1997). Garrison (1997) posits that it is through critical reflection and collaborative confirmation in which self-monitoring occurs and, as a result, knowledge is constructed. Self-monitoring is indeed a self-regulated process in which the learner observes, judges, and reacts to the activities (Bandura, 1986). Like self-management, the learner's responsibility for their own learning involves the ability to use strategies conducive to the learning environment. When a teacher navigates a website to find information related to their literacy program, for example, they might monitor their learning by considering the various selections from a list of hyperlinks (observing), forming an opinion about the title of a relevant link (judging), and then clicking on and reading the article or lesson in full in order to determine how it can be integrated into their current literacy program (reacting).

Finally, Garrison (1997) suggests "motivation plays a very significant role in the initiation and maintenance of effort toward learning and the achievement of cognitive goals" (p. 26). Two types of motivation are highlighted in Garrison's (1997) model: entering motivation and task motivation. A learner is motivated to enter a new learning situation when they perceive it as valuable and connected to a personal goal. Being motivated and deciding to enter an online learning environment is often interest-driven and, for a practicing teacher, more likely to occur when the content is connected to their classroom context. A teacher's decision to continue perusing a website is dependent on their task motivation. As Garrison (1997) states, "to direct and sustain motivation [teachers] must become active learners" (p. 28). They must actively decide whether the information is meaningful and, based on this, whether it is worthwhile to continue using a selected site. Motivation has been connected to greater learner control, which implies that the learner is the one who considers the content, approach, and value to the learning experience (Caffarella, 1993). With greater learner control individual needs are more likely to be met in teachers' quest for pedagogical knowledge and instructional materials.

Online environments are conducive to SDL as they provide opportunities for learners to interact with technologies in personally meaningful ways (Moore, 2016). Teachers' SDL is often intertwined with their instruction. When they are involved in the constructs of SDL (self-management, self-monitoring, and motivation), their learning will likely influence and, ideally, support their teaching practice (Putnam & Borko, 2000). Through their ability to self-direct their learning in online environments, teachers have a greater chance of selecting appropriate and related information and constructing knowledge that can have a direct effect on their teaching practice, and ultimately on student learning.

Evidence from research in teacher learning over the past 30 years shows that professional development can lead to improvements in instructional practices and student learning (e.g., Borko, 2004). As Borko discussed in her seminal 2004 paper:

> For teachers, learning occurs in many different aspects of their practice, including their classrooms, their school communities, and professional development courses or workshops. It can occur in a brief hallway conversation with a colleague, or after school when counseling a troubled child. (p. 6)

To understand teacher learning we must study it within these multiple contexts, considering both the individual teacher-learners and the context in which they are participants. In our study, teachers individually self-directed their learning in the context of online environments. To capture teachers' thought processes about their teaching practices and learning strategies, we used the virtual revisit think aloud. As a result, we have gained greater insight into teachers' self-directed learning as it occurs in online environments. Generating this data can contribute to better decisions about and increased quality of informal online learning opportunities for teachers. The following research questions guided this study:

1. What cognitive and behavioral strategies do elementary teachers engage in during a series of SDOL sessions?
2. Are there any changes in elementary teachers' cognitive and behavioral strategies over a series of SDOL sessions?

Methods

Research Design

This study employed a multiple method research design that included both qualitative and quantitative approaches. A multiple methods design was selected to gain an in-depth understanding of teachers' thought processes and web-based behaviors during a series of SDOL sessions. The qualitative component involved a general inductive approach to analysis (Thomas, 2006): through an open-coding technique, think aloud and interview transcripts were analyzed through a series of repeated readings. The quantitative component involved descriptive statistics, specifically frequencies and percentages of the participants' observed strategies and behaviors within and across the three SDOL sessions.

Our main data source was the virtual revisit think aloud, an alternative type of think aloud that generates data on teachers' cognitive processes and decision-making strategies *while* teachers engage in online learning (Beach & Willows, 2017a). Think aloud methods have been used across research domains to explore the ongoing cognitive processes that occur during a task performance (Ericsson & Simon, 1984; 1993). Over the past several decades, researchers have incorporated various types of think alouds into their research, with the concurrent and retrospective think alouds as the most common approaches (Kuusela & Paul, 2000). The concurrent think aloud requires participants to verbalize their thoughts aloud while they simultaneously complete a task.

The retrospective think aloud, on the other hand, requires participants to think aloud after a task has been completed. While these two types of think alouds have been widely used, they both have serious limitations. For instance, cognitive load increases during the concurrent think aloud since the participant is asked to complete a task while at the same time verbalize their thoughts. This can have a negative impact on how the participant completes the task as well as the act of thinking aloud (Beach & Willows, 2017a). While the retrospective think aloud avoids this conflict, much of the data during the task is lost or omitted during the retrospective think aloud since the participant must recall their decisions after the task has been completed and usually without any aids (Beach & Willows, 2017a). The virtual revisit think aloud avoids the limitations of the concurrent and retrospective think aloud by using a screen-capture recording of participants' navigations. The screen-capture recording is viewed by participants immediately following their navigation. Participants verbalize their thoughts while viewing their actions and behaviors. As a result of the aid of their screen-recording, participants recall their navigational decisions and why they made them.

Participants

Twelve practicing elementary teachers from Ontario, Canada volunteered to participate in this study. All participants provided informed consent prior to their participation. Table 1 presents participants' demographic characteristics.

Table 1

Demographic Characteristics

Characteristic		Frequency ($N = 12$) n (%)
Teaching Experience		
	1–5 years	7 (58%)
	6–10 years	5 (42%)
Age Range		
	25–29	6 (50%)
	30–34	3 (25%)
	35–39	3 (25%)
	40+	0
Current Grade		
	Kindergarten (JK/SK)	5 (42%)
	Primary (Grades 1–3)	2 (17%)
	Junior (Grades 4–8)	4 (33%)
	Multi-grade range	1 (8%)
Type of School		
	Public	8 (67%)
	Private/Independent	3 (25%)
	Unknown	1 (8%)

Websites

Prior to each session, participants were provided with the URLs of two literacy-oriented PD websites: *The Balanced Literacy Diet: Putting Research into Practice in the Classroom* (www.LitDiet.org) and *Reading Rockets: Launching Young Readers* (www.readingrockets.org). We selected these websites as starting points for the SDOL sessions for consistency across participants and because of their popularity among elementary teachers, research-informed content, and freely accessible resources. Participants were free to navigate these websites, select hyperlinks to additional sites, or use sites with which they were familiar.

Procedure

Participants met for three monthly one-on-one SDOL sessions with a member of the research team. All sessions were remote using Zoom and took place between November 2020 and February 2021. Participants completed a short online questionnaire prior to their first meeting. Questionnaire items related to demographic information (see Table 1). Each session followed a sequence of events and lasted approximately 45 minutes. First, the session began with the participant sharing their professional goal as it related to their current literacy practice (see Table 2 for types of goals). Next, the participant completed a 20-minute open-ended task to use the internet as they normally do when seeking information related to their teaching practice. An open-ended task was used to reflect as naturally as possible, how the participants use the internet for their professional learning in literacy. For instance, during an open-ended task, participants were free to peruse websites of interest, click on additional links, and view videos and photographs (additional behaviors are discussed in the results). Specifically, the researcher stated the following prior to the participant's navigation:

> We are interested in teachers' online behaviours and thought processes as they engage in self-directed online learning experiences in the context of literacy education. We have provided you with two literacy-oriented websites. You may use these websites or any other website that you would like to as it relates to your teaching practice in literacy. You will have 20 minutes. Feel free to take notes using a word document. As you navigate online, your actions will be recorded using a screen-capture recording program.

Participants shared their screen via Zoom and began their navigations. Their behaviors were captured using Camtasia Studio, a screen recording computer software program developed by TechSmith.

Immediately following participants' 20-minute navigation, the recording of their navigation was shared with them via Zoom and the virtual revisit think aloud was conducted: as participants viewed their online choices virtually, they verbalized their thoughts aloud. Participants were specifically given the following information:

> We are interested in what you were thinking about during your online navigation. In order to do this, I am going to ask you to think aloud while you view a recording of your navigation. What I mean by think aloud is that I want you to tell me everything that you were thinking from the time you began navigating the website until the end of your navigation. I would like you to talk aloud constantly. I don't want you to try to plan out what you say or try to explain to me what you are saying. Just act as if you are alone in the room speaking to yourself. It is most important that you keep talking. While you talk I will be recording your think aloud using a digital recorder.

To avoid disruptions during the think aloud, prompts and interventions were kept to a minimum (Jaspers, 2009). Participants were only prompted if they fell silent for 30 seconds. None of the participants required prompting during any of the SDOL sessions. In addition, the screen-recording continued to run and was not paused during participants' think aloud. Following the last SDOL session, a semi-structured interview was conducted.

Table 2
Participant Goals

Type of Goal		Session 1 n (%)	Session 2 n (%)	Session 3 n (%)
Student-focused				
	Targeting specific student needs	1 (8%)	2 (17%)	1 (8%)
	Home-school connection	1 (8%)	0	1 (8%)
Classroom-focused				
	Targeting grade level	2 (17%)	0	0
	Resource specific	1 (8%)	0	1 (8%)
	Assessment-focused	1 (8%)	1 (8%)	0
Literacy-focused				
	Targeting & planning for literacy skill(s)	6 (50%)	6 (50%)	5 (42%)

Pedagogy-focused			
Seeking out broader educational information & filling in knowledge gaps	0	2 (17%)	3 (25%)
Focusing on teaching structure	0	1 (8%)	0

Notes. An open-coding analysis, similar to the analysis described below, was conducted on participant statements related to their session goal to determine the types of goals reported by participants across the three sessions; during session 3, one participant did not state a goal.

Data Sources
Multiple sources of data were obtained for triangulation, contributing credibility to the findings by converging more than one source of information (Golafshani, 2003).

Online Questionnaire
A questionnaire was administered to participants to obtain data on a range of relevant demographic characteristics.

Virtual Revisit Think Aloud
Audio recordings captured participants' verbalizations ("thinking aloud") as they viewed their navigational recordings.

Screen-Capture Recordings
Camtasia Studio was used to record participants' computer screen during their online navigation.

Semi-Structured Interviews
A semi-structured interview followed the participants' navigations. Questions related to participants' general feelings of their SDOL sessions. Sample questions included: What were your general feelings during your navigations? What did you find challenging during the three sessions? Were there any websites/resources that stood out to you? And, Do you feel that you gained information about your literacy program during these sessions? The entire list of interview questions is included in Appendix A.

Data Analysis
We adapted the main themes and subthemes from the analysis and results of the pilot study (Beach et al., 2021b) to code this study's think aloud and interview transcripts (see Appendix B for coding scheme). Initially, the pilot study involved an inductive approach to analysis in which the data from the think alouds and interviews were reduced to themes because of repeated coding, comparisons, and categorizations (Creswell, 2007). Utterances or thought units verbalized by participants during the think alouds and interviews were coded based on a repeated reading of the transcripts. We used an open-coding technique in which the transcripts were segmented into meaningful units and then described using a word or short phrase. These descriptions were based on our interpretations of the data and related to the research questions. Coding each meaningful thought unit meant that the researchers were not limited to a set number of words. As a result, some thought units were only a few words while others consisted of entire paragraphs. Along with using the pilot study themes to code this study's transcripts, we also employed an open-coding technique to determine additional codes based on the current dataset. First, all members of the research team coded approximately 10% of this study's transcripts using the four main themes and sub-themes from the coding scheme. The researchers met to

review how they coded each thought unit. Each thought unit was discussed and reviewed. This review resulted in a 96% agreement rate. Therefore, two of the research team members divided and coded the remaining transcripts.

The quantitative data involved the screen-capture recordings. These were analyzed using a time-sampling observation analysis where participants' web-based behaviors were counted and recorded in 10-second intervals (Beach & Willows, 2017a). Specifically, while viewing the 20-minute screen recordings, members of the research team documented each web-action exhibited by participants every 10 seconds using an excel spreadsheet. Prior to this analysis, a list of actions (e.g., enters a search term) was determined based on the pilot study (see Appendix C). Themes and sub-themes across the SDOL sessions were also tallied. Frequencies are reported below.

Results

We provide a summary of the results according to the research questions, including an overview of each theme that resulted from the qualitative analysis. We include direct participant quotes to help support each theme. Results are also presented in several tables.

What Cognitive and Behavioral Strategies Do Elementary Teachers Engage in During a Series of SDOL Sessions?

Cognitive Strategies

Over a four-month period, participants demonstrated cognitive strategies that fall under four main categories: Metacognitive awareness, monitoring learning, evaluating information, and increases in self-efficacy. It is clear in Table 3 that the majority of thought units related to monitoring learning (Session 1: $n = 705$, 57%; Session 2: $n = 608$, 53%; Session 3: $n = 566$, 55%). Thought units related to self-efficacy were coded the least often across the three sessions (Session 1: $n = 85$, 7%; Session 2: $n = 87$, 8%; Session 3: $n = 65$, 6%). Table 4 further breaks down the main themes and presents the frequencies of thought units related to each sub-theme. The themes are described below. Examples of participant quotes are included to provide support for each theme.

Table 3
Frequencies and Percentages of Thought Units Coded for Each SDOL Session

Theme	Session 1 N (%)	Session 2 N (%)	Session 3 N (%)
Metacognitive Awareness	294(24)	305(27)	286(28)
Monitoring Learning	705(57)	608(53)	566(55)
Evaluating	142(12)	140(12)	110(11)
Self-Efficacy	85(7)	87(8)	65(6)
Total	1,226(100)	1,140(100)	1,027(100)

Table 4
Frequencies of Thought Units Related to the Sub-Themes Across the Three SDOL Sessions

Theme	Sub-theme	Session 1	Session 2	Session 3	Total
Metacognitive Awareness					
	Diversion	102	77	58	237
	Recounting	35	39	55	129
	Observing	97	140	125	362
	Recollecting	53	43	38	134
	Reflecting	7	6	10	23
Monitoring Learning					
	Searching & Filtering	69	45	39	153
	Skimming through	103	105	73	281
	Deep reading	6	21	11	38
	Saving information	32	34	28	94
	Connecting to practice	495	403	415	1,313
Evaluating					
	Source credibility	93	97	74	264
	Source accessibility	16	7	10	33
	Source quality	33	36	26	95
Self-Efficacy					
	Goal setting	37	31	30	98
	Personalizing	25	25	17	67
	Enhancing knowledge	19	23	17	59
	Vicarious learning	4	8	1	13

Metacognitive Awareness. Participants employed strategies related to *metacognitive awareness*—participants' awareness of their own thinking and strategy use led them to better understand their choices in relation to their goals. Participants noted moments when they became distracted or confused and how these moments influenced their navigations. For instance, during the first SDOL session one participant noted how she needed to be aware of her browsing behavior and related professional goals: "I tend to sometimes divert from what I'm doing and do something else to be distracted and go onto a billion different other things and then eventually come back to my main goal." Participants also commented on how their lack of understanding would lead them to navigate elsewhere. For instance, in reference to an unclear lesson plan one participant acknowledged: "It's also confusing, these names don't say the letter sound, it only says the name, so I found that difficult to understand so I think I just left that site."

Participants also recounted their web-based behaviors. This, in turn, allowed them to not only comment on their decisions but also *why* they made them. For instance, one participant described her decision to click on a specific tab: "I clicked classroom tips because I was looking for centers and informal assessment to see if there was anything here that was relevant to that." Similarly, a participant provided a rationale for selecting an external link: "I was curious about the communication milestones, so I eventually ended up clicking on that link." In another instance, this same participant explained: "This is me trying to expand this video because I was interested in her evaluation continuum."

Participants also noticed resources that were of professional interest to them. For instance, one participant "saw that they have a character analysis graphic organizer. So [she] thought maybe if it's complex [she] can simplify it a bit." Additionally, participants were drawn towards information that was familiar to them and that they could immediately relate to their current practice. One participant described how writing activities "caught [her] eye" as she scrolled through a list of lesson plan ideas. Participants were generally attracted to new, yet relatable information. As they navigated, they were "very intrigued" by and described how they "definitely will be going back and taking a look at these [resources] in the future." They often recollected information by returning to websites, as was the case for one participant who decided to return to one of the given sites during her second SDOL session. During her interview she recalled her navigational intentions:

> So today I decided to go back into Reading Rockets because I really like to see the research and information that they present on literacy and other resources and lesson ideas. The layout is really easy to navigate through and I had a few things in mind.

Another participant described a similar objective: "I decided to go back to the Reading Rockets and to move into the next section after phonemes, moving into some more phonics."

Monitoring Learning. Across the three sessions, participants most often *monitored their own learning*; they were observing, judging, and reacting to newly found material as it related to their professional goals and teaching practice. Specifically, a common strategy involved searching and filtering. More general searches seemed to occur at the beginning of a participant's navigation. For instance, one participant noted: "I always start my search with something very generic just because I'm curious to see what's out there." Another participant stated that "when it comes to navigating the Literacy Diet site, I tend to go grade specific." On this website, this participant found "using the recipe finder and the filter function" helpful to narrow down her search. At various time points throughout their navigation, participants also searched specific topics related to their teaching goals. For instance, one participant described how she used the search engine within a particular website to filter options related to "social-emotional development because this is a personal research interest of mine that I'm working on and seeing as an issue that is prominent in the class."

Searching topics and filtering options often led participants to skim "through what's there." By "skimming and scanning" various webpages, participants were able to observe, judge, and react to topics of potential interest and decide whether the site was worthwhile to continue perusing. For instance, one participant reflected on the recent switch to remote learning. She noted: "As I was quickly skimming through, I realized this is a lot to do with in-person teaching and I really needed to refine my search as I get more creative with how I was going to be teaching word study."

Skimming through information also led participants to make decisions about whether they might return to a specific site. For instance, a participant "did a quick scroll to see if [she] liked the way that the list was done. [She] did, so [she] saved it to come back to later and to have a more detailed look." As participants skimmed, they "quickly looked through titles," "browsed and perused to see if anything caught [their] eye," "flipped through to see if anything captivated [them]," and "looked for keywords that jumped out and looked relevant."

The process of skimming sometimes led participants to review information in greater depth. This involved a more thoughtful and deliberate reading. For instance, after finding an article about reading aloud in the primary grades, one participant noted how she "was reading about the benefits of read aloud and how it helps build knowledge." Another participant emphasized her careful reading to fully understand the content: "I was reading it very carefully to make sure I understood what this activity was asking, adapting it to suit where I thought was necessary to apply it to the situation, I wanted it in and just typing it out very carefully." Similarly, during her third session a participant described her close reading of a particular topic: "I'm reading this closely just to see what some traits or ways are they consider one to be active or an active citizen, especially for children."

Participants also saved information through bookmarking, downloading, note-taking, and printing out documents. This was especially the case when participants found direct connections between the information and their classroom contexts. For instance, one participant noted how she would delve deeper into an article later: "So I save this one on my computer. I was looking through it and then there was reading tips for parents for grade three so again, this is really good. I'll come back for this one later." Saving information appeared to directly relate to active planning during the participants' navigations. For instance, one participant remarked on an activity being described by a teacher in a demonstration video: "I like how she numbered it and used different colors to name the groups for them to understand easily in terms of that, so I think I should do that, and save that for later." Another participant began to consider how she might tweak an activity to suit her current students: "It was more so like a grade two activity, but I do love modifying. I love finding [activities that are] easier or harder and changing it up. I can get creative with that."

As participants continued their navigations and their time engaged in the SDOL sessions, they felt inspired to locate new ideas and learning experiences for their students. For instance, one participant remarked: "I'm looking for some inspiration for some media literacy activities and I started off by referencing the curriculum again." This participant continued sharing her plans related to media literacy and how she was interested in expanding her current teaching unit: "We've looked at print ads, commercials, we've talked about jingles and slogans, we've talked about target audiences, hidden messages, obvious messages and so I was looking for something to expand on that or something different." For all participants, it appeared that the SDOL sessions were beneficial to their own professional learning and instructional planning, particularly in the context of their current classroom: "So again, I was reading through to see what materials were needed for this particular lesson, how applicable or how relevant is it to what's happening in the classroom right now?"

Evaluating Information. Participants *evaluated* information as they navigated various websites and resources; they were assessing the source credibility, accessibility, and quality of information. For instance, participants noted their attention to the source and whether the source was a credible author, an organization or field expert they could trust to provide them with accurate information. One participant stated: "And then my eye caught this university because I know they're a well-respected university, so I was curious what their teaching guide would say." Similarly, another participant noted that she "really enjoyed that these come up with university-based resources, that are going to be based on academic truth and strong foundational principles that I specifically believe in." Additionally, during her third SDOL a participant remarked: "Going down, checking again references, just want to make sure there's some sort of reliability, academic quota that's being hit, and not just going off someone's gut feeling." Participants found it helpful to "scroll through reading through what the experts have to say."

Along with source credibility, participants noted the accessibility of various websites and resources. They were most interested in material that was free of charge and membership. For instance, one participant "was quite impressed because there were a lot of free books, which is nice." Participants also noted websites' architecture, as in one participant who commented on the "well laid out websites" which she found to be "really helpful for teachers." Participants also referred to the accessibility of the content:

> And what I really love about this site particularly, is that it makes a lot of those larger concepts really digestible and then super useful for those that are really versed in it but also really great for those who don't necessarily have a lot of experience within the realm or with the vocabulary or whatever it may be.

Throughout all three SDOL sessions, participants also evaluated the quality of the websites. One participant, for instance, "just liked how everything was so wonderfully scaffolded and again looking at the list of narratives and just, you know, always showing them examples, really strong examples." They were intrigued by the possibilities of various online resources, particularly those that were of varying levels where information could be tweaked according to student interest and academic progress. For instance, one participant described how one online resource "was interactive and had a lot of possibilities in it for different activities and different levels." The quality of the literacy content on various websites was also a point of reference in terms of the participants' evaluation. For instance, one participant described:

> It's so nice that they have so much for literacy so that whenever I seem to be looking for something, I can usually find pretty quickly exactly what I'm looking for which is always nice as a teacher so you're not scrolling the internet looking for something and not being able to find it.

Increases in Self-Efficacy. Finally, participants experienced increases in *self-efficacy*; their confidence in their ability to complete a task or achieve a goal related to their literacy practices appeared to be affected by their SDOL experiences. Although this theme resulted in the least number of thought units across the three sessions, the strategies related to self-efficacy are relevant, nonetheless. These included goal setting, drawing on personal experiences, and reflecting on literacy learning. Participants also demonstrated vicarious learning in which increases in confidence for teaching literacy appeared to result from viewing a demonstration video or teaching resource.

By setting goals at the beginning of each session and noting goals throughout their navigations, participants were able to stay focused. One participant noted how she would otherwise get distracted by other topics of interest: "I was focusing on writing strategies today because last time I got side-tracked a lot." Goals were obtainable and seemed related to their students' needs and interests. For instance, one participant described her focus on two students: "One of my goals is to think about G's retention of sight words and ability to transfer knowledge." This led her to search and select material that aligned with this goal and student needs. Later in the same session, this participant stated: "And then I'm thinking about another student, a goal I have for him, he is struggling with recall of sight words." As participants navigated through the various material they often reflected on their goals: "So when I was starting, I was taking a little bit to think about my goal and trying to have something that was doable." Similarly, halfway through her second SDOL session, a participant reflected: "Then I was back to my original goal, literacy milestones in terms of things that would perhaps come to play in the classroom."

Participants also drew on personal experiences as well as their own literacy learning during their SDOL sessions. These reflections seemed to create connections to the material. For instance, as one participant viewed a demonstration video she noted: "I spend a lot of time with prekindergarten students, so I was thinking, as I watched this, about some of the stuff that I naturally do when I'm just hanging out with kids anyway." Similarly, another participant reflected on her experience observing other teachers. This seemed to provide her with a critical lens on how socio-emotional development is integrated in the classroom, a topic of personal interest: "I'm thinking about how I've seen or observed teachers in my placements or other experiences, how have they effectively taught social emotions, or have they taught it at all?"

Although there were only a relatively small number of thought units coded as vicarious learning, moments of vicarious learning may have contributed to increases in confidence for teaching literacy. For instance, while viewing a demonstration video one participant stated: "It's also funny because when I did it last year, I hadn't done it in a long time, so it was nice to watch someone else do one." Another participant was keen on understanding how a teacher articulated learning goals to her students since this was something the participant found difficult to do: "I'm looking at the learning goal to see how she articulates it because it's really hard to put down every learning goal, but actually this is a great idea." By viewing another teacher's practice, participants appeared to gain confidence in their own teaching.

Behavioral Strategies

Participants engaged in a range of web-based behaviors during the SDOL sessions (see Appendix C). Note-taking and video viewing occurred most often across the three sessions. Participants also explored information by opening webpages; they used various web features, including interactive virtual classroom tours, and they changed the course of their navigation by opening external links, using the back button, and opening new tabs.

Are There Any Changes in Elementary Teachers' Cognitive and Behavioral Strategies Over a Series of SDOL Sessions?

As shown in Figure 1, the strategies related to participants' metacognitive awareness, monitoring learning, evaluating, and self-efficacy generally remained constant across the three sessions. These findings corroborate the results from the pilot study (Beach et al, 2021b); regardless of the session number, participants demonstrated strategies that were interconnected and iterative. Strategies did not appear to progress in a linear way but rather overlapped and potentially influenced each other. For instance, participants did not begin their first SDOL session with more general cognitive strategies, such as recounting or skimming through, and then move towards higher level cognitive strategies throughout their second and third SDOL sessions, such as deep reading and connecting to practice (Beach, 2017b). It is possible that the number of sessions limited any potential for change. Additionally, this study did not use an intervention and therefore, there was not a single moment to prompt any change. Future research could integrate a workshop or tutorial related to SDOL over several more SDOL sessions.

Interestingly, participants monitored their learning most often across the three sessions. This suggests that as they sought out and delved into personally meaningful topics, they made decisions about whether the material was relevant to their teaching practice; participants were acutely attentive to their personal goals (Garrison, 1997).

Figure 1
Main Themes Across Sessions
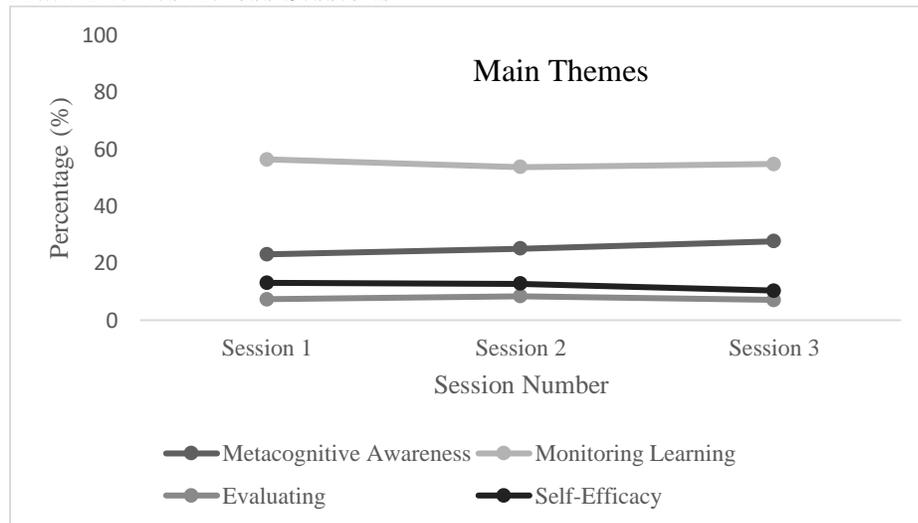
In terms of participants' SDOL behaviors, a notable finding relates to how participants increasingly took notes and saved information across the three sessions. It is possible that as the sessions continued, participants became more comfortable about the process. They may have also realized that these sessions were not only part of a research study but were also valuable learning and planning opportunities for themselves.

Discussion

Our findings corroborate our pilot study results (Beach et al., 2021b) suggesting that SDOL is a valuable source of teachers' professional learning regardless of how often it occurs. Based on our findings, it appears that SDOL fosters teachers' metacognitive awareness, ability to monitor their learning, and critically evaluate content and resources. In addition, our findings show that the teachers in our study increased their self-efficacy for teaching literacy while participating in SDOL. The strategies enacted by our participants appear to align with higher-order cognitive processes, as outlined by Horz and Schnotz (2010). Participants' ability to think about their strategies and navigational choices, for instance, provided them with ample opportunities to redirect their course of action, narrow down topics of interest, and reflect on their options during their navigations; they self-managed their learning experiences. Garrison (1997) suggests that self-management involves the cognitive management of learning and the construction of meaning through critical reflection. By employing metacognitive strategies and critically analyzing information, participants were able to build onto existing knowledge as well as construct new knowledge that was personally meaningful and tied to their instruction.

Our findings also suggest that participants monitored their learning during their navigations. Monitoring learning involves the acute attention to personal goals (Garrison, 1997). This makes it an especially useful process to enact during SDOL. The teachers in this study planned and modified their learning and instructional planning with goals in mind. Most of the participants shared literacy-focused goals before each SDOL session. This seemed to help guide and regulate their navigations to achieve an intended outcome. This finding aligns with Callanan et al.'s (2011) work, which suggests that learning opportunities become personalized when the individual has a particular goal in mind. As many of the participants demonstrated, their searches allowed them to make observations and consider potentially relevant material. Similar to Peters-Burton and Botov's (2017) participants who demonstrated strategies related to monitoring learning, our participants skimmed and scanned information for relevance while keeping their personal goals in mind. By skimming material, they also formed judgements and opinions about whether it was worthwhile to delve deeper and engage in a careful reading of the material.

Note-taking appeared to be an especially effective strategy for delving into and better understanding topics of interest. This finding aligns with prior research that has suggested notetaking supports deep comprehension (Kobayashi, 2005), particularly during online learning (Zhu et al., 2022). Note-taking provides learners with opportunities to encode information into long-term memory, aiding in the organization of incoming information (Kobayashi, 2005). It is possible that the participants in the current study were able to think more deeply about the information they documented as it related to their literacy instruction and teaching goals. While we did not follow up with participants, it is also possible that participants revisited their notes later to review their newly learned material and consider how they might integrate it into their instruction. The benefits of notetaking during SDOL should be further examined, as well as how we might be able to utilize note-taking tools within online learning platforms to facilitate teachers and other site users in employing notetaking during learning.

Along with being metacognitively aware and managing their learning, participants appeared to evaluate the information and material they viewed. Across the three sessions, participants thought critically about the source, accessibility, and quality of information. Through their unique teaching lenses, the participants in our study sifted through information while at the same time engaged in a critical evaluation of the material.

Online resources accessed by teachers to enhance their professional learning come from a range of sources, some based on solid evidence and others on opinion, experience, and incentives, and thus their quality and relevance vary. It appears that the teachers in our study were able to view and select material through a critical lens. This finding is in contrast with a previous study we conducted examining whether preservice teachers critically evaluate online sources they use for their literacy planning and instruction (Beach, 2020). Survey results indicated that the preservice teachers often selected online resources based on accessibility of material and visual appeal (Beach, 2020). These types of online resources, like Teachers Pay Teachers and Pinterest, are not monitored by credited evaluators and can often include inaccurate or misleading information. Perhaps the difference in findings is based on field experience. It could also be suggested that this difference is due to a higher social media presence in the lives of preservice teachers. More research should be done to further investigate this distinction.

Participants in our study also seemed to gain confidence in their literacy instruction. Although observed less often than the other cognitive strategies, strategies related to self-efficacy may have contributed to the participants' motivation and feelings of support. Self-efficacy for teaching literacy has been described as a teacher's self-perceptions of their competency with the activities of literacy teaching (Tschannen-Moran & Johnson, 2011).

Given the affirmations and connections the participants made to the material, it is possible that participants' confidence and motivation to continue learning about a specific topic increased during and across the SDOL sessions. Similar to Colwell and Hutchison's (2018) participants who found Twitter to be a beneficial space for learning about other teachers' practices, our participants were able to relate to teachers in online spaces and potentially felt motivated to continue their navigations.

Finally, our findings provide further evidence of the benefits of using the virtual revisit think aloud to understand how and why teachers specifically, and internet users more generally, self-direct their learning in online environments. Given that participants viewed a screen-recording of their navigation immediately following the task, verbalizations included more complex reasonings. By virtually revisiting their SDOL experience, participants were able to explain their judgements and decision-making processes. The types of cognitive strategies participants employed can be considered more higher-level learning processes (Krathwohl, 2002). Rather than merely describing their behaviors or reading text on various webpages, participants provided rationales. As a result, we gained an increased understanding of their use of the internet for their professional learning.

While our findings contribute to the literature on professional learning by generating data on elementary teachers' cognitive and behavioral strategies during SDOL experiences, there are two main study limitations that should be taken into consideration when interpreting the results. First, this study used a relatively small sample size with all participants residing in the same region of Canada. While the focus of qualitative research relates to individuals' experiences, a larger sample size across regions and countries would provide more substantial evidence related to our research questions. The second limitation relates to the context of this study, literacy education at the elementary level. We call for future research that examines the SDOL experiences of teachers and instructors across subject areas and educational levels.

Conclusion

Overall, the findings from this study suggest that elementary teachers employ strategies related to metacognitive awareness, monitoring learning, and evaluating during SDOL and that these types of learning strategies are a valuable approach to informal PD for practicing elementary teachers. Additionally, SDOL appears to provide a space for elementary teachers to build their confidence and self-efficacy for teaching literacy. This appears to be the case regardless of how often SDOL occurs. These findings have implications for website developers and organizations interested in providing online professional learning opportunities for teachers. Providing access to online activities that optimize the use of SDL strategies, like notetaking, has the potential to engage teachers in their professional learning, create opportunities for knowledge construction, and contribute to teachers' instructional methods. An additional context-specific contribution relates to the participants' literacy goals. Asking participants to consider a literacy-related goal during their online navigations could have helped participants be more efficient in their online actions and search strategies. They were able to home in on their goals in relation to their learning strategies and teaching practice. If teacher educators and professional development administrators consider incorporating SDOL tasks into their coursework, discussing content-specific goals prior to such learning tasks can potentially lead to an increase in engagement and learning.

Although we did not pose a research question related to the virtual revisit think aloud, we do suggest that this method has the potential to be used across domains in education and online learning. Online teaching and learning researchers can use the virtual revisit to document participants' SDOL, regardless of the context or nature of the learning task. Understanding the strategies used by online learners, as well as why they access resources can contribute new knowledge about informal online learning and the platforms used by self-directed online learners. Moreover, accurately tracking how websites are navigated by target users can facilitate better decisions about and increased quality of SDOL opportunities.

References

Alshaikhi, H. I. (2020). Self-directed teacher professional development in Saudi Arabia: EFL teachers' perceptions. *Theory & Practice in Language Studies*, *10*(11), 1359–1369. http://dx.doi.org.proxy.queensu.ca/10.17507/tpls.1011.03

Beach, P., & Willows, D. (2017a). Understanding teachers' cognitive processes during online professional learning: A methodological comparison. *Online Learning, 21*(1), 60–84. http://dx.doi.org/10.24059/olj.v21i1.949

Beach, P. (2017b). Self-directed online learning: A theoretical model for understanding elementary teachers' online learning experiences. *Teaching and Teacher Education, 61,* 60–72. https://doi.org/10.1016/j.tate.2016.10.007

Beach, P. (2020). Planning for literacy instruction: An evaluation of online resources used by preservice teachers. *Contemporary Issues in Technology and Teacher Education.* https://citejournal.org/volume-20/issue-3-20/english-language-arts/planning-for-literacy-instruction-an-evaluation-of-online-resources-used-by-preservice-teachers/

Beach, P., Minuk, A., & Favret, E. (2021a). Online teacher professional development in Canada: A review of the literature. *Canadian Journal of Learning and Technology, 47*(2). https://doi.org/10.21432/cjlt27948

Beach, P., Favret, E., & Minuk, A. (2021). Exploring teachers' cognitive processes and web-based actions during a series of self-directed online learning sessions. *International Journal of E-Learning & Distance Education.* http://www.ijede.ca/index.php/jde/article/view/1191

Borko, H. (2004). Professional development and teacher learning: Mapping the terrain. *Educational Researcher, 33*(8), 3–15. https://doi.org/10.3102/0013189X033008003

Bruce, C. D., Esmonde, I., Ross, J., Dookie, L., & Beatty, R. (2010). The effects of sustained classroom-embedded teacher professional learning on teacher efficacy and related student achievement. *Teaching and Teacher Education*, *26*(8), 1598–1608. https://doi.org/10.1016/j.tate.2010.06.011

Caffarella, R. (1993). Self-directed learning. *New Directions for Adult and Continuing Education 57*, 25–35. https://doi.org/10.1002/ace.36719935705

Callanan, M., Cervantes, C., & Loomis, M. (2011). Informal learning. *Wiley Interdisciplinary Reviews: Cognitive Science, 2*(6), 646–655. https://doi.org/10.1002/wcs.143

Campbell, C., Osmond-Johnson, P., Faubert, B., Zeichner, K., & Hobbs-Johnson, A. (with Brown, S., DaCosta, P., Hales, A., Kuehn, L., Sohn, J., & Steffensen, K.). (2016). The state of educators' professional learning in Canada. *Learning Forward*. https://learningforward.org/wp-content/uploads/2017/08/state-of-educators-professional-learning-in-canada.pdf

Colwell, J., & Hutchison, A. C. (2018). Considering a Twitter-based professional learning network in literacy education. *Literacy Research and Instruction*, *57*(1), 5–25. https://doi.org/10.1080/19388071.2017.1370749

Creswell, J. W. (2007). *Qualitative inquiry and research design: Choosing among five traditions* (2nd ed.). Sage.

Darling-Hammond, L., & Richardson, N. (2009). Research review/teacher learning: What matters. *Educational Leadership: Journal of the Department of Supervision and Curriculum Development, 66*(5), 46–53. https://www.ascd.org/el/articles/teacher-learning-what-matters

De Vries, S., van de Grift, W. J., & Jansen, E. P. (2014). How teachers' beliefs about learning and teaching relate to their continuing professional development. *Teachers and Teaching*, *20*(3), 338–357. https://doi.org/10.1080/13540602.2013.848521

Elliott, J. C. (2017). The evolution from traditional to online professional development: A review. *Journal of Digital Learning in Teacher Education*, *33*(3), 114–125. https://doi.org/10.1080/21532974.2017.1305304

Ericsson, K. A., & Simon, H. (1993). *Protocol analysis: Verbal reports as data* (Rev. ed.). The MIT Press.

Garrison, D. R. (1997). Self-directed learning: Toward a comprehensive model. *Adult Education Quarterly, 48*(1), 18–33. https://doi.org/10.1177/074171369704800103

Golafshani, N. (2003). Understanding reliability and validity in qualitative research. *The Qualitative Report, 8*(4), 597–607. https://scholar.google.com/scholar_lookup?title=Understanding%20reliability%20and%20validity%20in%20qualitative%20research&publication_year=2003&author=N.%20Golafshani

Griffith, R. (2017). Preservice teachers' in-the-moment teaching decisions in reading. *Literacy, 51*(1), 3–10. https://doi.org/10.1111/lit.12097

Horz, H., & Schnotz, W. (2010). Cognitive load in learning with multiple representations. In J. L. Plass, R. Moreno, & R. Brunken (Eds.), *Cognitive load theory* (pp. 229–252). Cambridge University Press.

Jaspers, M. W. (2009). A comparison of usability methods for testing interactive health technologies: Methodological aspects and empirical evidence. *International Journal of Medical Informatics*, *78*, 340–353. https://doi.org/10.1016/j.ijmedinf.2008.10.002

Jurasaite-Harbison, E., & Rex, L. A. (2010). School cultures as contexts for informal teacher learning. *Teaching and Teacher Education, 26*(2), 267–277. https://doi.org/10.1016/j.tate.2009.03.012

Knowles, M. (1975). *Self-directed learning: A guide for learners and teachers.* Association Press.

Kobayashi, K. (2005). What limits the encoding effect of note-taking? A meta-analytic examination. *Contemporary Educational Psychology*, *30*(2), 242–262. https://doi.org/10.1016/j.cedpsych.2004.10.001

Krathwohl, D. R. (2002). A revision of Bloom's taxonomy: An overview. *Theory into Practice*, *41*(4), 212–218. https://doi.org/10.1207/s15430421tip4104_2

Kuusela, H., & Paul, P. (2000). A comparison of concurrent and retrospective verbal protocol analysis. *American Journal of Psychology, 113*(3), 387–404. https://doi.org/10.2307/1423365

Kyndt, E., Gijbels, D., Grosemans, I., & Donche, V. (2016). Teachers' everyday professional development: Mapping informal learning activities, antecedents, and learning outcomes. *Review of Educational Research*, *86*(4), 1111–1150. https://doi.org/10.3102/0034654315627864

Lantz-Andersson, A., Lundin, M., & Selwyn, N. (2018). Twenty years of online teacher communities: A systematic review of formally-organized and informally-developed professional learning groups. *Teaching and Teacher Education, 75*, 302–315. https://doi.org/10.1016/j.tate.2018.07.008

Macià, M., & García, I. (2016). Informal online communities and networks as a source of teacher professional development: A review. *Teaching and Teacher Education, 55*, 291–307. https://doi.org/10.1016/j.tate.2016.01.021

Moore, M. G. (2016). Thirty years later: Self-directed learning and distance education—In retrospect. *International Journal of E-Learning & Distance Education, 31*(2). http://www.ijede.ca/index.php/jde/article/view/1000

Owen, S. M. (2015). Teacher professional learning communities in innovative contexts: 'Ah hah moments', 'passion' and 'making a difference' for student learning. *Professional Development in Education*, *41*(1), 57–74. https://doi.org/10.1080/19415257.2013.869504

Parsons, S. A., Hutchison, A. C., Hall, L. A., Parsons, A. W., Ives, S. T., & Leggett, A. B. (2019). US teachers' perceptions of online professional development. *Teaching and Teacher Education: An International Journal of Research and Studies, 82*(1), 33–42. https://doi.org/10.1016/j.tate.2019.03.006

Ponti, M. (2014). Self-directed learning and guidance in non-formal open courses. *Learning, Media and Technology, 39*(2), 154–168. https://doi.org/10.1080/17439884.2013.799073

Putnam, R., & Borko, H. (2000). What do new views of knowledge and thinking have to say about research on teacher learning? *Educational Researcher, 29*(1), 4–15. https://doi.org/10.3102/0013189X029001004

Simons, P. R. J. (2000). Towards a constructivistic theory of self-directed learning. *Self-directed Learning,* 1–12. https://dspace.library.uu.nl/handle/1874/6994

Thomas, D. R. (2006). A general inductive approach for analyzing qualitative evaluation data. *American Journal of Evaluation*, *27*(2), 237–246. https://doi.org/10.1177/1098214005283748

Trotter, Y. (2006). Adult learning theories: Impacting professional development programs. *The Delta Kappa Gamma Bulletin, 72*(2), 8–13.

Trust, T., & Prestridge, S. (2021). The interplay of five elements of influence on educators' PLN actions. *Teaching and Teacher Education*, *97*, 103–195. https://doi.org/10.1016/j.tate.2020.103195

Tschannen-Moran, M., & Johnson, D. (2011). Exploring literacy teachers' self-efficacy beliefs: Potential sources at play. *Teaching and Teacher Education, 27*(4), 751–761. https://doi.org/10.1016/j.tate.2010.12.005

Zhu, M., Bonk, C. J., & Berri, S. (2022). Fostering self-directed learning in MOOCs: Motivation, learning strategies, and instruction. *Online Learning, 26*(1), 153–173. https://olj.onlinelearningconsortium.org/index.php/olj/article/view/2629

Appendix A

Semi-Structured Interview Questions

1. What were your general feelings during your navigations?

2. What did you find challenging while over the four sessions?

3. Were there any websites/resources that stood out to you?

4. What was it about these websites/resources that made them stand out?

5. Was there anything missing that you would like to have seen/viewed?

6. Do you feel that you gained information about your literacy program during these sessions?

7. Have you incorporated or do you plan to incorporate any of the information that you found?

8. What other forms of professional learning do you regularly engage in? Would like to engage in?

9. Is there anything else you would like to share about the sessions or the think aloud exercise?

Appendix B

Coding Scheme

Code	Sub-code	Definition
Metacognitive Awareness		*Being aware of one's own thinking and strategy use*
	Diversion	Becoming distracted or confused as a result of a technical or platform issue
	Recounting	Describing web behaviour
	Observing	Noticing web features, tools, or resources
	Recollecting	Returning to familiar websites and resources
	Reflecting	Reflecting on the think aloud and learning process
Monitoring Learning		*Consciously making sense of information and requiring acute attention to personal goals*
	Searching & Filtering	Narrowing one's focus by searching and filtering
	Skimming through	Reading quickly at the surface level, noting relevance and key ideas
	Deep reading	Thoughtful and deliberate reading
	Saving information	Encoding information through bookmarking and note-taking
	Connecting to practice	Actively planning and extending ideas while considering students, current literacy practice and cross-curricular connections; immediate relevance
Evaluating		*Constructing meaning through critical reflection and managing incoming information*
	Source credibility	Awareness and consideration of the source authorship and trustworthiness
	Source accessibility	Considering the platforms efficiency and ease of use
	Source quality	Considering the degree of excellence in relation to familiar high-quality resources
Self-Efficacy		*Confidence in one's ability to complete a task or achieve a goal*
	Goal setting	Referring to a learning goal
	Personalizing	Drawing on personal experiences and feelings, and reflecting on personal teaching philosophy
	Enhancing knowledge	Reflecting on own literacy learning
	Vicarious learning	Increases in confidence for teaching literacy from viewing a demonstration video or teaching resource

Appendix C
List of Actions Used for Time-Sampling Observation
Analysis & Frequencies Across Sessions

Main Category	Action	Session 1	Session 2	Session 3
Using web tools/features				
	Enters search term	20	23	33
	Selects interactive feature	3	7	8
	Uses interactive feature	8	19	57
	Selects filter option	31	13	10
Exploring information				
	Opens content page	94	55	74
	Opens page about background info.	18	15	10
	Opens home page	29	29	14
	Opens lesson plan	61	24	23
Viewing and engaging with videos				
	Starts a video	18	21	19
	Views a video	137	204	186
	Stops a video	9	5	7
	Skips in video	10	2	2
Saving information for future retrieval				
	Takes notes	211	239	299
	Saves information	1	19	26
Changing course				
	Opens external link	10	19	36
	Uses back button	50	27	50
	Opens new tab	28	32	50
	Switches tab	199	136	149
	Closes tab	41	25	44

Scaffolding a Culminating Assignment Within a Community and Task-based MOOC

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Abstract
We aim to understand the impact of scaffolds within a digital workbook to facilitate self-directed learning for learners completing a final project within a community and task-based MOOC. Optional reflection and articulation prompts were embedded in the tool support assignment development. Workbook use was prevalent, with 65% of learners using it to some extent. Our qualitative analysis revealed that assignment responses associated with substantial workbook use were A) informally written and loosely connected to assignment objectives (36%), or B) well-articulated and connected to assignment objectives (29%). Responses associated with little to no workbook use were C) superficial or uncontextualized (29%), or D) consistent with type "B" responses (6%). We discuss implications for instructors and learning designers in scaffolding complex projects in MOOCs.

Keywords: MOOCs, scaffolding, self-directed learning, community learning

Massive Open Online Courses (MOOCs) offer the possibility of "anytime, anywhere" learning, an appealing option for working professionals, lifelong learners, and even full-time students (edX, 2017). Based on an open-learning model, mainstream MOOCs provide learners with open access to learning materials, including instructional content from highly ranked universities from across the globe (Najafi et al., 2015; Hollands & Tirthali, 2014; Downes, 2008). Although critics have pointed to limiting factors of the model such as few opportunities for social interaction and basic assessment options (c.f., Reich et al., 2019), others have postulated that MOOCs hold promise to be a "rich landscape of learning" (Fischer, 2014) through pedagogical innovations such as social learning platforms (Ferguson & Sharples, 2014) and project-based learning designs (Pinto et al., 2020; Verstegen et al., 2015).

During the COVID-19 pandemic, interest in MOOCs increased, with providers seeing drastic growth and dramatically increased enrollments (Shah, 2020). Coursera, a prominent MOOC provider, witnessed the largest increase, with 35 million new enrollments from mid-March to the end of July 2020 (Lohr, 2020). It is apparent that learners have found flexible, new ways of learning that allow them to sharpen their professional skills and be responsive to the evolving workplace (Zhu et al., 2022). With this influx of MOOC learners, it is important to recognize that although MOOC platforms are built to accommodate large numbers of learners, instructors have limited opportunities to provide direct support to learners (Bali, 2014; Rohs & Ganz, 2015). To enable assessment at scale, MOOC platforms use auto-graded assessments (e.g., multiple choice quizzes) and peer-graded assignments to allow for personalized feedback (Kasch et al., 2021). Thus, with most MOOCs available on demand, learners progress at their own pace and must engage in self-directed learning to be successful and meet their goals (Zhu & Bonk, 2019).

Instructors can play an important role in facilitating self-directed learning through design choices that they implement in their MOOCs (Zhu & Bonk, 2019; Zhu, 2022). Although not prominently featured in the literature on self-directed learning in MOOCs, one such design choice is the intentional use of *scaffolds* that leverage learning technologies and software embedded in the learning experience (Saye & Brush, 2002). Scaffolds are conceptualized as any process by which an instructor or more knowledgeable peer provides assistance enabling less experienced learners to succeed in challenges that would otherwise be too difficult if attempted on their own (Wood et al., 1976). Studies that examine technology scaffolds in MOOCs have largely focused on fostering self-regulation and time management skills broadly for learners to successfully complete MOOCs (c.f., Gutiérrez-Rojas et al., 2014; Milikić et al., 2018; Pérez-Sanagustín et al., 2020; Sambe et al., 2018), rather than scaffolds created to foster reflection and task completion within course projects (e.g., peer reviewed assessments). This study considers how scaffolding prompts—embedded within a digital workbook tool in a resilient teaching MOOC—can facilitate self-directed learning within the context of a culminating, peer-reviewed assignment. Thus, this study offers an expanded view of instructor-led strategies for fostering self-directed learning using articulation and reflection technology scaffolds, filling a gap in the current literature on self-directed learning in MOOCs.

Objectives

Our overarching goal is to contribute to literature that identifies the "unique contributions of MOOCs to a rich landscape of learning" (Fischer, 2014, p. 7). We do this through our study of a MOOC on resilient designs for learning (Quintana et al., 2020), henceforth known as the *Resilient Teaching MOOC*. The course was offered at the onset of the COVID-19 pandemic to

assist instructors and learning professionals who were planning for a year filled with challenges and uncertainty. In keeping with Fischer's (2014) call for learning scientists to explore innovative, multi-dimensional aspects of learning in MOOCs, the design of the Resilient Teaching MOOC aimed to bridge two design trade-offs that exist between cognitive and social dimensions of learning, and instructivist and problem-based, self-directed learning.

We characterized the pedagogical design of the Resilient Teaching MOOC as *community and task-based,* following Anders' (2015) model of MOOC learning designs. This model is typified by a combination of social and instructional support mechanisms and were instantiated in the Resilient Teaching MOOC in the following ways:

> **Community-based:** The instructor stated the objective of supportive social engagement through instructional videos and presented multiple opportunities for social interaction across discussion forums.

> **Task-based:** The pedagogical design followed a task-based structure, with scaffolds contained within the course's digital workbook (e.g., prompts) indexed to relevant course content, leading up to a culminating assignment that required learners to synthesize and apply concepts from the entire course.

> 1. The specific objective of this study is to understand the efficacy of the *task-based* aspect of the design by examining the impact of a digital workbook that contained prompts designed to foster reflection on course content and enable learners to articulate a resilient teaching plan (i.e., through a culminating assignment) in a stepwise fashion throughout the course. The course was designed to facilitate self-management and self-monitoring on the part of learners by employing articulation and reflection scaffolds. To understand the effects of this highly structured design, we pursued the following research questions. What happens when digital workbook prompts are used to scaffold a culminating assignment within the Resilient Teaching MOOC?

> 2. To what extent are assignment objectives met when learners choose to (or choose not to) adopt the digital workbook?

> 3. What are the characteristics of assignment submissions when learners choose to (or choose not to) adopt the digital workbook?

Literature Review

Massive Open Online Courses have long been associated with transfer-oriented pedagogies and self-paced learning approaches (Eisenberg & Fischer, 2014). Although some early MOOC designs (i.e., cMOOCs) promoted connectivism (c.f., Downes, 2009), the xMOOC model (i.e., cognitive-behaviorist approach) has largely eclipsed the cMOOC model in recent years. Fischer et al. (2014) offered a perspective for weighing the design tradeoffs that exist between these contrasting MOOC designs. The "rich landscape of learning" approach offers a range of *antinomies*—pairs of complementary truths, each of which is worth pursuing in different contexts all while presenting contradictions and tensions for learners and instructors (Bruner, 1996; Fischer et al., 2014). This rich design space centers on the following multi-dimensional aspects of learning: who, why, what, how, where, when, and with whom. Each dimension can be conceptualized in a "connectivist" or "instructivist design" and that choice

offers certain affordances while coming at specific costs. Fischer et al. (2014) posited that the challenge then becomes to find ways to bridge these design tradeoffs to enrich learning designs.

Creating a Rich Landscape for Learning Through Hybrid MOOC Models

The work of forging a *middle path* as prompted by Fischer et al. (2014) in MOOC design is underway, with scholars thinking about integrating disparate typologies into hybrid models to allow for a more integrated and flexible approach. Such hybrid models are more consistent with existing MOOC designs, countering the narrative that MOOCs are "monolithic entities'" (Major & Blackmon, 2016). Lane (2012) outlined three MOOC typologies: 1) network-based, which are exemplified in connectivist designs where the focus is on socially-constructed knowledge through exploration of open educational resources and discussion; 2) task-based, whose designs center on skill acquisition and demonstration, with a secondary emphasis on community and social interaction; and 3) content-based, which are exemplified in extended MOOC designs (i.e., xMOOCs) where content acquisition is the primary objective, followed by networking and task completion. To acknowledge the integrated approach that already exists within many MOOC designs (Major & Blackmon, 2016), Anders (2015) built on Lane's (2012) typology of three MOOC types (network-based, task-based, and content-based) and proposed three *hybrid models* that could better account for the diversity of theories and applications that exist beyond the dichotomous categories of cMOOC and xMOOC. According to Anders (2015), hybrid models have the potential to "balance the strengths and weaknesses of the xMOOC and cMOOC models" (p. 46) by attending to the needs of specific audiences and instructional goals.

All of the hybrid models expounded by Anders (2015) contained an elaboration of the basic typologies by Lane (2012). Anders' (2015) *network-based hybrid model* included a higher level of technological support and scaffolding. The original connectivist MOOCs (i.e., cMOOCs) were enacted through participant-initiated technology integrations, with a variety of technological tools and supports serving to structure the course in a somewhat ad hoc manner. The network-based hybrid model retained an emphasis on community-directed learning and inquiry, with the inclusion of a higher level of scaffolding and technological support. Network-based hybrid models may be particularly valuable for professionals and lifelong learners, since they embody a learning environment that closely mirrors workplace environments, placing a high importance on personalized, professionalized, and situated learning (Milligan & Littlejohn, 2014). The introduction of scaffolding into "connectivist" MOOCs may encourage retention and progress—addressing the "drop off" phenomenon observed by Clow (2013)—potentially "unlocking uniquely valuable learning opportunities" (Anders, 2015, p. 55) for participants.

Content-based hybrids, as described by Anders (2015), use didactic content from MOOCs as the basis of a blended, interactive, and customized experience with a small group of learners. Content-based hybrids may leverage blended learning opportunities, by supplementing cohort-based, face-to-face instruction with digital content that was originally intended for a large audience of MOOC learners. In this way, they can be considered an expansion of xMOOC designs. Within higher education contexts, content-based hybrids can leverage high-quality instructional materials produced for at-scale learning environments and social learning experiences that occur within localized environments. In one example of a content-based hybrid, Ibrahim et al. (2021) described a "choose your topic" MOOC for a global audience of learners that was used as the basis of a small private online course (SPOC) enacted in a university setting. The MOOC included a wide range of topics, with lectures provided by over 25 nationally recognized faculty experts. The course was used as the basis of a two-week elective for second- or third-year pediatric residents. Students within the SPOC were required to complete all

elements of the MOOC as well as additional in-depth readings assigned by the local course instructor. Students in the SPOC were also expected to participate in whole group discussions. SPOC instructors were able to create a differentiated learning experience focusing on a particular aspect of medical education, while using the MOOC materials as a foundation.

Finally, the *community and task-based hybrid model* described by Anders (2015) used project and artifact creation as a means of advancing skill development within a supportive learning community. The community aspect of this hybrid model was strongly rooted in socio-cultural theories of learning that emphasized fostering dialogue and discussion amongst members of the learning community. Diversity of ideas were prized in an effort to advance socially negotiated forms of knowledge construction, similar to that of knowledge building models described by Scardamalia and Bereiter (2014). The model relied on extensive scaffolding and support structures to enable task completion as well as enabling social interaction. Mackness et al. (2013) described a community and task-based hybrid MOOC that was designed to support professionals in higher education transition into a non-academic career in industry. In their design, more active and experienced learning communities were instrumental in "creating the emergent spaces supporting connectedness and interactivity" (Mackness et al., 2013, p. 156). In a MOOC series focused on educational leadership, Quintana et al. (2020) advanced a related pedagogical model called *self-directed/community-supported learning* that enabled learners to develop professional competencies through applied work structured around an activity structure called "team practice." In the enactment of this pedagogical design, course designers and instructors aimed to draw diverse learners around the world into a community of discourse and practice through coordinated video content presentations, web-based enrichment activities, scenario-based team practice exercises, and community-wide discussion. Quintana et al. (2020) observed that more experienced and active members of the community acted as role models and guides, providing necessary support for learners who may have had less experience in educational leadership and policy. Similarly, in a MOOC focused on teacher professional development, Håklev and Slotta (2017) combined small-scale intense collaboration with large-scale knowledge-building efforts through a set of learning activities and projects that were indexed to a community knowledge base. Other MOOCs exemplify the community and task-based model, including those that lean toward the community aspect (c.f., FemTechNet White Paper Committee, 2013; Levine, 2013) and those that focus on the task-based aspect (c.f., Beaven et al., 2014; Mackness et al., 2013). In the present study, we elaborated on MOOC designs that embody the integrated *community and task-based* model, which are consistent with the design of the Resilient Teaching MOOC detailed in this study.

Scaffolding for Hybrid MOOC Models

Both the networked-based hybrid model and the community and task-based model require the implementation of additional scaffolds to support learners participating in these ambitious designs for learning. While the foundational scholarship on educational scaffolds was not describing support for at-scale learning environments, it is still relevant when considering the utility, type, and effectiveness of the scaffolds. Wood et al. (1976) established a key definition of scaffolding as a temporary instructional process where a more knowledgeable teacher or peer can control elements of a complex task in ways that allow the learner to focus on activity that is within their ability and ultimately engage in problems that would otherwise be beyond the learner's reach. The MOOC design context demands a modified approach given that course designs do not require that instructors take an active role in course *enactment* (Bonk et al., 2018).

Similarly, while learners may function as "more knowledgeable peers," this is not always a given, considering the range of experiences that learners may bring to a learning situation (Gregori et al., 2018). In addition, low participation rates in MOOCs (c.f., Clow, 2013) could inhibit the impact of peer support.

Thus, in the open, online space, course designers and instructors may opt to rely on what some scholars have called "hard scaffolds," which are static, anticipated, and planned supports based on known difficulties and challenges that learners are likely to encounter (Brush & Saye, 2002). Hard scaffolds can be introduced into an at-scale, online learning environment through course delivery platforms and integrated technologies, providing scaffolds to learners. Designers and instructors can make use of technological affordances to provide "hard" scaffolds that impact learners' understanding of not only new content areas, but also how they should think about completing a given task.

Quintana et al. (2004) advanced a framework for technology-enabled scaffolds that were based on three processes of inquiry: *sense-making*, *process management*, and *articulation and reflection*. While these three scaffolding categories were initially conceptualized in a science education context, these categories can be more broadly applicable to other contexts and research areas. *Process management* scaffolds involve mechanisms that guide knowledge construction and strategies to steer investigation (Quintana et al., 2004, p. 358). Scaffolds of this sort are necessary in spaces where learners lack the insight and experience of a more experienced practitioner that would aid them in navigating complex processes and challenges. To this end, Quintana et al. (2004) posited that scaffolds should provide structure for learners' tasks while illuminating "what steps are possible, relevant, and productive" (p. 359). *Articulation and reflection* scaffolds are necessary for learners to communicate inquiry findings and reflect on those findings to better understand one's strengths and weaknesses in terms of conceptual mastery (p. 369). To support this process, instructional designs should encourage learners to articulate and reflect on their ideas in ways that are productive in the context of their respective fields of study (p. 370-371). Finally, *sense-making* scaffolding could be broadly construed as necessary for learners to reason about new ideas and concepts, to engage with representations that are part of a discipline, and to build on their intuitive ideas as they engage with new material. Each of these processes and their corresponding scaffolds involves engaging learners in tasks that are "cognitively complex and are often implemented in a social activity such as discussion, negotiation, and consensus-building" (Quintana et al., 2004, p. 341). While these scaffolding approaches can be conceptualized more generally to apply to different contexts, the work by Quintana et al. (2004) was more focused in exploring how scaffolding features can be developed for technology-situated learning tools and environments. This provides a perspective to consider how scaffolding features can be applied in online learning contexts.

Much of the work on scaffolds in MOOCs has been focused on supporting more metacognitive awareness by learners. For example, Sambe et al. (2008) used scaffolds in MOOCs to address known challenges of self-regulation to promote strategic planning and encourage consistent study habits. In other MOOC designs, scaffolds were provided to show feedback to learners about activity in the course and examine how these scaffolds affect performance and outcomes (Milikić et al., 2018; Pérez-Sanagustín et al., 2020). In another example, MyLearningMentor aimed to guide learners towards course completion by offering timely and helpful tips to help learners monitor their own work in productive ways (Gutiérrez-Rojas et al., 2014). There have been fewer published studies that explicitly make connections

between scaffolds designed to support learners' reflections on course content and subsequent application to a new context (e.g., their own work settings).

In this study, we focus on the use of *articulation and reflection scaffolds* that are enabled through an LTI (i.e., hard scaffolds) in a MOOC on resilient teaching. As we will describe, these scaffolds were situated within a MOOC design that embodied *a community and task-based hybrid model*.

Methods and Theoretical Frameworks

Our theoretical frameworks are defined by the two components of the hybrid model that the MOOC design embodied: 1) community-based approaches to instruction and 2) task-based learning.

A long-held view espoused within the learning sciences is that learners play an important and active role in their own learning (Roschelle, 1997) and that learners learn best when activity is situated within a rich social context, which includes collaboration and exchanges with peers (Vygotsky, 1978). This view is complementary to the concept of a "community of practice" advanced by Lave (1991) and Wenger (1998; 2011), in which learners engage in sustained and distributed learning in authentic contexts alongside more knowledgeable peers and mentors. A practical instantiation of this idea was realized by Brown and Campione (2002) in their model called Fostering a Community of Learners. In this form of pedagogy, an entire classroom community is engaged collectively, with well-defined learning goals for both content and practice, with each member responsible for contributing diverse perspectives and expertise to the advancement of a common goal. Although these theoretical frameworks did not originate in open, large-scale learning environments, they serve as inspiration for advancing social learning opportunities and productive peer-to-peer interactions within highly structured course designs. To enable such rich, social interactions within MOOCs, recent research in the learning sciences has explored the efficacy of designs that push on platform affordances (c.f., Quintana et al., 2020; Håklev & Slotta; 2017; Slotta & Najafi, 2013).

In keeping with the "rich landscapes for learning" vision presented by Fischer (2004), MOOC instructors and designers are experimenting with more flexible open-ended tasks such as project-based approaches (c.f., Pinto et al., 2020; Verstegen et al., 2015). Such complex designs require elevated levels of support, but without the possibility of direct instruction, self-directed learning models should be considered. Garrison (1997) characterized three interrelated elements of self-directed learning: motivation (entering the task); self-monitoring (cognition and metacognition), and self-management (task control). Thus, to be successful within the context of self-directed, project-focused learning opportunities in MOOCs, learners must cultivate self-directed learning skills, including self-management and self-monitoring strategies (Zhu, 2021). A vital consideration is the role that instructors can play in facilitating self-management and self-monitoring skills in MOOCs through design choices. Instructors can create opportunities for learners to set their own learning goals, provide time frames and progress indicators, and offer flexible learning resources and peer assessments (Zhu & Bonk, 2019; Zhu, 2022). The present study examines the impact of carefully designed articulation and reflection scaffolds to support self-management (completion of the culminating assignment) and self-monitoring (reflection on course concepts and connection to relevant contexts).

Research Context

The Resilient Teaching MOOC is a four-week course, designed to support instructors at all levels who grappled with the realities of changing and evolving instructional contexts,

brought on by the onset of the COVID-19 pandemic. The MOOC was situated as a "community-oriented" open, online learning experience (DeVaney & Quintana, 2020), where learners and instructors could come together, share experiences, and develop implementable teaching plans to address some of the difficulties encountered during the period known as "emergency remote teaching" (Hodges et al., 2020). The MOOC consisted of lecture videos, readings, discussion prompts, quizzes, reflection prompts, and a culminating, peer-reviewed assignment. The first part of the course presented a resilient design for learning framework, consisting of three principles: extensibility, flexibility, and redundancy (Quintana et al., 2021). Following lectures, quizzes, and reflection opportunities that delved into the principles, learners viewed a worked example that demonstrated all the principles in action. The remainder of the course focused on the development of learners' own resilient teaching plans, which were intended to be crafted and tailored to their own instructional contexts and to be used as a guide for both planning and implementation.

Digital Workbook

The digital workbook was integrated into the Resilient Teaching MOOC using learning technology interoperability (LTI) protocols at several points throughout the course. Each workbook prompt was indexed to specific course topics and activities within the instructional sequence, allowing learners the opportunity to pause and reflect on new information in small, related chunks which served as the foundation of the culminating assignment prompt (see Figure 1). The reflections drafted by each learner were saved to their own private instance of the workbook, and learners could review these entries at any point during the course. Additionally, learners had the ability to download selected entries or their complete collection of workbook entries to refer to once they completed the course. If learners opted to do so, they could share their workbook entries to a public gallery space in which peers could view and comment on one another's entries. The commenting functionality within the shared-response gallery space resembles a comment section that enables learners to utilize a text field to share reactions, offer feedback, and ask questions. The original entry author as well as other peers can reply to comments, creating conversation threads that serve to guide the original author's reflection on their understanding and application of course concepts.

Reflection prompts were embedded in a digital workbook and indexed to course topics (Appendix A). The course's instructor made the goals of the culminating project known from the outset, and the reflective prompts were designed to feed into the peer-reviewed assignment, aiding learners to construct a draft of their final project. The reflective prompts encouraged learners to carefully reflect on how each design principle could be applied in their work context. The reflection prompts were optional and ungraded.

Immediately preceding the culminating assignment, a textual description summarized course activities that led up to the final assignment and reminded learners that they could draw on their existing workbook entries. The passage also encouraged learners to take some additional time to refine their writing and to prepare a shareable resilient teaching plan.

The instructions for the final project asked learners to describe their context of teaching and learning, the interactions they desire to facilitate, and then to "explain how the principles of extensibility, flexibility, and redundancy are informing how you are thinking about facilitating those interactions." Learners were directed to review earlier reflection prompts that were most closely associated with project requirements (Appendix B).

Figure 1

Digital Workbook Alignment with Culminating Assignment Prompts

Note. Top panel: Example of a digital workbook prompt learners completed during their weekly course tasks. Bottom panel: Example of one of the culminating peer review assignment prompts. The prompt explicitly directs learners to refer to the digital workbook prompt that is indexed to that prompt.

Research Design

Our research design consisted of two phases (see Figure 2). In phase one, we gathered learner submissions to the culminating course assignment and analyzed the quality of those responses using our evaluation rubric (discussed in the Approach to Analysis section below). In phase two, we adopted and modified an explanatory sequential mixed methods research design developed by Plano Clark & Creswell (2011). This approach begins with "the collection and analysis of quantitative data" intended to address a research question, followed by the "collection and analysis of qualitative data" that builds on the results of the quantitative analysis (Plano Clark & Creswell, 2011, p. 71). We used quantitative methods to group assignments into a 2 x 2 grid, based on their rubric scores and number of workbook prompts completed. We used qualitative coding methods to analyze the characteristics of assignments in each of the four groups.

Figure 2
Modified Explanatory Sequential Mixed Methods Design Stages
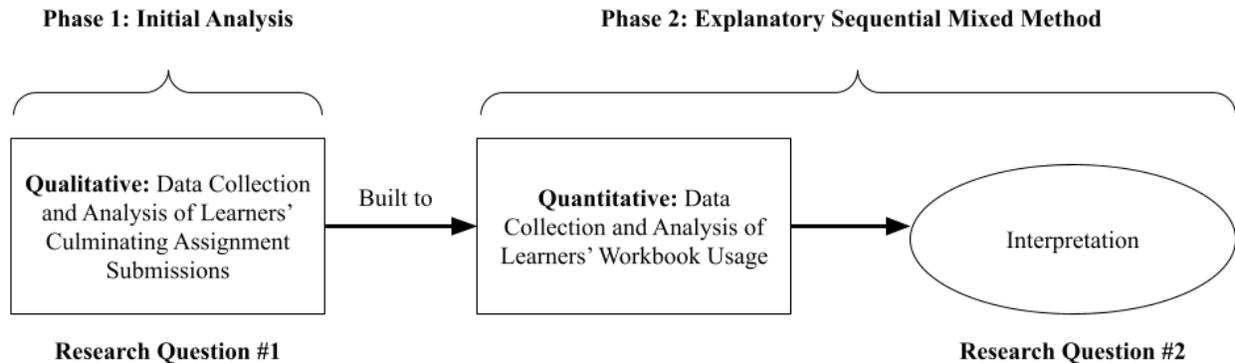
Data Sources

We collected assignments (n=80) submitted during the first four months that the MOOC was offered on the Coursera platform (n.d.), between June and September 2020. We eliminated one duplicate assignment, one plagiarized assignment, and one advertisement and arrived at our final dataset (n=77). We chose to analyze the first four months of learner data from the course because this timeframe represents a critical time early in the pandemic when instructors were still determining how they would implement online learning design plans intentionally (as opposed to reactionary measures, such as emergency remote teaching) and in preparation for the start of a new academic year.

Participant Backgrounds and Professional Contexts

Through a review of learners' assignment submissions, we were able to identify a range of learner professions, professional contexts, and subject areas. Most learners represented in our data set were educators (i.e., instructors teaching in a formal educational setting). Other professional experiences were represented as well, including professional training facilitator, physician, executive director, student, and instructional designer. A strong majority of the MOOC learners operated in higher education contexts, followed by several learners who worked in K-12 settings, and only a couple who were employed in the private sector. A wide range of subject areas were represented, from social science, language arts, education, and medicine to law, engineering, and computer science. Refer to Appendix C for more details on the backgrounds of the learners in this study.

Approach to Analysis

We analyzed responses to the final prompt (Prompt 5) from the resilient teaching plan: *Explain how the principles of extensibility, flexibility, and redundancy inform how you are thinking about facilitating interactions in your course.* We chose to analyze this prompt because it encapsulated the key learning goals of the course, which were to develop a nuanced understanding of the resilient design for learning framework and apply it to an authentic instructional context. To adequately respond to this prompt, learners needed to demonstrate a competent understanding of the principles of resilient designs for learning and the ability to apply those principles in their specific context. Other prompts available for analysis offered a much less holistic perspective of learners' level of content mastery.

Although the checklist style of rubric is an appropriate choice for peer assessment because it is easy to use and results in consistent evaluation, it was not sufficiently nuanced for our research objectives. Hence, we developed two analytic rubrics, which were more detailed than the instructor-developed rubric used for peer review. Both rubrics consisted of three categories (not addressed, addressed, nuanced reflection) and focused on the following aspects: assignment objectives (rubric one) and teaching context (rubric two). Rubric one assessed the extent to which learners met assignment objectives, making specific reference to the three principles of resilient design for learning. Nuanced responses also showed evidence of the application of resilient teaching principles within a specific context and provided specific examples of how targeted interactions were supported (Table 1).

Table 1
Rubric Used to Assess the Extent to Which Learners Met Assignment Objectives

Not addressed	Addressed	Nuanced reflection
No mention of three principles	At least one principle is addressed	All three principles are addressed
Principles are referenced, but not applied to a specific teaching context	Principle(s) is/are applied in a specific teaching context	Principles are applied in a specific teaching context
Response shows some evidence of understanding of the three principles, but this understanding is not made explicit		Specific examples of how principles support various interactions are given

Rubric two focused on situational factors (e.g., points of failure, unknown situations) in teaching contexts, with reflections focusing on contextual factors that can be addressed by a learning design (Table 2).

Table 2
Rubric Used to Assess the Extent to Which Learners Addressed Situational Factors in Teaching Contexts

Not addressed	Addressed	Nuanced reflection
No mention of contextual factors (MVP, unknowns, failure)	Factors are addressed directly (i.e., MVP, unknown, failure conditions are described).	Factors are addressed directly (i.e., MVP, unknown, failure conditions are described).
	Factors can be directly addressed by mirroring terms provided in prompt (i.e., MVP, unknown, failure conditions) or through paraphrasing these ideas.	

| Factors are referenced, but not applied	Factors are discussed in a specific teaching context	Factors are discussed in a specific teaching context
		Teaching plan provides specific examples of how factors will be addressed

Using these rubrics, two coders independently coded the first 15 assignments in the dataset and achieved an interrater reliability (IRR) score of 0.67, a "moderate" level of agreement (McHugh, 2012). Through discussion, they came to a consensus and refined the two rubrics for greater clarity. They independently coded the next 15 assignments, reaching an IRR score of 0.85, a "strong" level of agreement (McHugh, 2012). The two coders each independently coded one-half of the remaining submissions.

We grouped scored responses into a two-by-two matrix, with rubric scores from low to high on the x-axis and workbook *use* from low to high on the y-axis. In other words, the responses were divided into four categories (see Figure 3) that represent a function of learners' use of the digital workbook and their overall ability to meet assignment objectives.

Figure 3
Four Types of Responses to Culminating Assignment Question Prompt
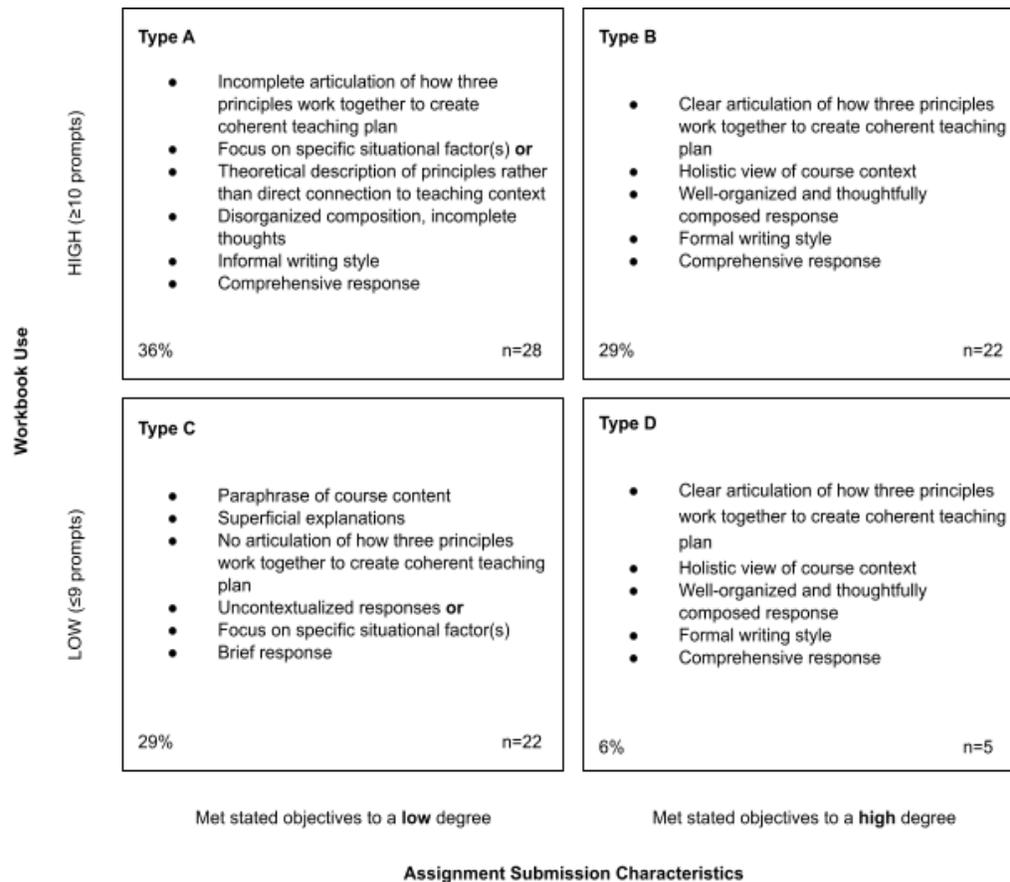
Responses that were associated with low rubric scores (i.e., left quadrants) were coded as having "addressed" or "not addressed" the assignment objectives. Responses associated with high rubric scores were coded as "nuanced" and positioned on the right quadrants. Since our coding focused on completed assignments and not the workbook entries themselves, we also wanted to consider whether learners whose assignments had received low or high scores had made significant use of the workbook. We considered "low use" of the digital workbook to be the completion of nine or fewer (of twelve) workbook prompts and positioned these instances in the lower two quadrants. We considered "high use" of the digital workbook to be the completion of ten or more (of twelve) workbook prompts and these responses were positioned in the upper two quadrants. We chose ten or more responses (of twelve) to represent "high" workbook use as this meant that a learner responded to 80% or more of the workbook prompts, and that they completed most of the workbook prompts presented in each course week. We reread assignment responses for each of these groupings and used conventional content analysis to analyze these groupings (Hsieh & Shannon, 2005), with codes derived directly from the assignment text. Our analysis resulted in a description of each quadrant or grouping of responses, as we will describe in the Results section.

Findings

Although use of the digital workbook was optional (i.e., not required for assignment submission or grading), 65% of learners who submitted a culminating assignment for peer review elected to use it to some extent. The following observations relate to our first sub-research question: To what extent are assignment objectives met when learners choose to (or choose not to) adopt the digital workbook? First, we will describe groupings of responses that were associated with **high workbook use**. We characterized 50 learners' (n=50) use of the digital workbook tool as "high." Of these learners, over half did not fully meet the stated assignment objectives (n=28) while 22 learners met the stated assignment objectives to a high degree through "nuanced reflection." Despite the majority of these responses not meeting assignment objectives directly, many of these responses showed evidence of reflection, as we will describe below in our content analysis. These groupings are presented in Figure 2 as Type A and Type B respectively.

Second, we will describe groupings of responses that were associated with **low workbook use**. Of learners who responded to <u>nine or fewer workbook prompts</u> (n=27), roughly three-quarters did not meet the assignment objectives to a full extent (n=22). A small minority of submissions exhibited nuanced reflection (meeting assignment objectives) but were not associated with workbook use (n=5). These groupings are presented in Figure 2 as Type C and Type D respectively.

While we cannot correlate workbook use and submission scores, we can make observations about the characteristics of the four response types, addressing our second research question: What are the characteristics of assignment submissions when learners choose to (or choose not to) adopt the digital workbook?

Type A responses (high workbook use, met assignment objectives to a low degree) were typified by *informality and indirectness*. Generally, they made a loose connection to assignment objectives but were incomplete in their articulation of how the three resilient design for learning principles were considered in the creation of a coherent teaching plan. Some focused on descriptions of specific situational factors of the instructional environments and others provided theoretical or "textbook" descriptions of the three resilient teaching principles. But all responses

lacked an integration of context and design principles. From a structural and stylistic perspective, these responses tended to be disorganized in their composition, containing incomplete thoughts, akin to a draft or personal journal.

Type B responses (high workbook use, met assignment objectives to a high degree) were typified by *completeness, coherence, and relevant detail.* They contained a clear articulation and holistic view of how the three resilient design principles could work together to create a coherent teaching plan. They provided a complete view of the instructional context and carefully integrated theoretical perspectives with contextual factors. From a structural and stylistic perspective, these responses tended to be well-organized, thoughtfully composed, and written in a formal writing style.

Type C responses (low workbook use, met assignment objectives to a low degree) were typified by *superficiality and lacking context*. These responses often paraphrased course content and offered uncontextualized explanations, sometimes focusing on specific situational factors. The responses did not provide a clear articulation of how the three resilient principles work together to create a coherent teaching plan. Structurally, these responses tended to be brief.

Type D responses (low workbook use, met assignment objectives to a high degree) were very similar in their characteristics, structure, and writing style to Type B responses. The significant difference is that learners in this group made limited use of the reflection prompts available in the workbook. Our findings are summarized below in Table 3.

Table 3
Summary of Key Findings

Research Question	Key Findings
RQ1: To what extent are assignment objectives met when learners choose to (or choose not to) adopt the digital workbook?	Of learners with *high* degree of workbook use (n=50): • 22 met stated objectives though "nuanced reflection" • 28 did not fully meet stated objectives Of learners with low degree of workbook use (n=27): • 5 met stated objectives through "nuanced reflection" • 22 did not fully meet stated objectives
RQ2: What are the characteristics of assignment submissions when learners choose to (or choose not to) adopt the digital workbook?	3 types of responses observed: • **Type A** (high workbook use, met objectives to a low degree)- informal tone, indirect, lacking coherence • **Type B** (high workbook use, met objectives to a high degree) & **Type D** (low workbook use, met objectives to a high degree)- complete, coherent, relevant detail, holistic view of course content • **Type C** (low workbook use, met objectives to a low degree) - superficial and uncontextualized, lack of cohesiveness with respect to course principles

One unexpected finding was that many responses associated with high level workbook use seemed more like drafts than polished writing. Although the framing instructions for the assignment asked learners to "*take some additional time to refine your thinking and prepare an initial resilient teaching draft*," it appeared that many learners did not complete this additional step. Given the prevalence of "Type A" responses (i.e., high workbook use, with assignments meeting objectives to a low degree), we investigated the connection between workbook responses and assignment components. In doing this, we observed that several submissions simply were copied-and-pasted from the digital workbook into the assignment submission area and submitted for peer review. While still capturing the basics of a resilient teaching plan, the structure and quality of these submissions was incongruent with our requirements for the culminating assignment. As we have described, the writing styles of these submissions could be characterized as informal and incomplete. It appeared as if learners neglected to translate their initial ideas into a teaching plan that could be easily understood by their peers. Although the reasons for this oversight are not apparent through the analysis of our dataset, we speculate that this could have occurred for a variety of reasons, including time constraints, lack of awareness that final assignments were lacking in rigor and quality, and the "checklist" style rubric used for peer assessment. It may also be that learners were aware that the assignment rubric did not specifically address matters of structure and style (for reasons we have already articulated) and thus did not focus on these elements in their responses.

Discussion

Our review of learners' culminating assignment submissions provided evidence that many learners took advantage of the digital workbook prompts to incrementally develop their final resilient teaching plan over the duration of the course (self-management). Our findings show that a high level of workbook use (i.e., completion of reflection prompts) corresponded to high quality written assignment responses for some learners. There was a small group of learners who did not engage in workbook use and still submitted high quality responses, but our findings suggest that this activity pattern was an outlier, given that most learners who submitted high quality responses used the workbook (self-monitoring). The majority of learners who opted not to participate in reflection and articulation through the workbook activity submitted assignments that met project requirements to a low degree. In other words, it appeared to be beneficial for learners to engage with these types of scaffolded prompts, despite the number of assignments that corresponded with high workbook use and failure to meet assignment objectives to a high degree, as we will describe in Additional Findings. Workbook activities contributed to the learning process and served as a resource to support fulfillment of culminating assignment objectives.

These results offer evidence that within complex MOOC designs articulation and reflection prompts (i.e., hard scaffolds) (Brush & Saye, 2002) can effectively support learners' 1) self-management toward completion of a culminating assignment and 2) self-monitoring to connect course concepts to their respective contexts. In this way, the embedded prompts facilitated self-directed learning (Garrison, 1997), enabling self-management (i.e., task control) and self-monitoring (i.e., cognition and metacognition). Workbook activities contributed to the learning process and served as a resource to support achievement of culminating assignment objectives.

We would like to note that our characterization of Type A responses as meeting assignment standards to "a low degree" relates to the requirements of the rubrics we developed for this research where we set the bar high for explicit connection to course concepts and application to an instructional context. The checklist-style rubric developed by the instructor for peer-assessment in the course led to a successful assignment outcome for most learners (i.e., a passing grade). While the reflective prompts attempted to spotlight what learners should be thinking about and articulating during the development of their teaching plan, it seems that some learners may have needed models (e.g., worked examples) to help them to see what a more complete response should look like, or reminders to help them see how they may need to iterate to develop more polished work. In other words, the reflective prompts may have helped some learners see what directions to go in, but further support may be needed to help them continue to work productively. Providing worked examples or other types of model artifacts was a capability of the digital workbook tool used. However, the project team did not anticipate how necessary making use of this capability would be given that this was a novel endeavor and therefore lacked any precedent to inform this design decision. Additionally, the project team was constrained by time limitations and bandwidth issues brought on by issues surrounding the COVID-19 pandemic.

Study Significance

This study examined the impact of carefully designed articulation and reflection scaffolds (Quintana et al., 2004) to support self-management (completion of the culminating assignment) and self-monitoring (reflection on course concepts and connection to relevant contexts). Although prior research has examined instructors' strategies for facilitating self-directed learning in MOOCs (c.f., Zhu & Bonk, 2019; Zhu, 2021), less attention has been paid to the use of articulation and reflection scaffolds to directly support self-directed learning in MOOCs. We have shown that articulation and reflection scaffolds can be effectively integrated into learning sequences through technology tools, opening opportunities for instructors to embed reflection and articulation prompts directly within a course. This possibility allows for instructors to include complex, open-ended projects, such as those that develop professional skills and competencies. While earlier work has relied on "companion" resources in the form of websites or fillable PDFs (c.f., Lambert, 2015; Quintana et al., 2021), our study shows that tighter integration of reflection prompts within a learning sequence can benefit the learning process. We have highlighted the utility of such prompts being tightly integrated into a learning design to support assignment development and completion, and reflection on course concepts and relevant contexts.

Our study also contributes to the larger conversation about hybrid MOOC models, specifically *community and task-based* designs (Anders, 2015). As part of the ongoing pursuit to better understand effective means for integrating flexible, open-ended tasks that support project-based pedagogies (Quintana et al., 2020; Håklev & Slotta, 2017), this study forges a path for instructors and designers seeking to develop more rigorous and relevant MOOCs, responding to the demand for high quality instruction that serves the demands of today's evolving workforce (Zhu et al., 2022). Future instructors and designers will be able to draw on this approach to further refine the practice of facilitating self-management and self-monitoring that promote self-directed learning in a MOOC setting.

While not the focus of the research questions and analysis of the current study, the findings are situated within the broader context of community-based approaches to instruction in open online learning environments. The stated goal of the Resilient Teaching MOOC was to

foster supportive social engagement, which included the opportunity for learners to share their own workbook entries and to provide early feedback on teaching plans to peers. In this way, course design embodied social learning and community-oriented pedagogies (Lave, 1991; Vygotsky, 1978; Wenger, 1998) and contributes to the recent body of learning sciences research that explores productive peer-to-peer interactions within complex, technology-enabled course designs (c.f., Quintana et al., 2020; Håklev & Slotta; 2017; Slotta & Najafi, 2013).

Limitations

As this work is situated within the MOOC space, our dataset is limited by learner autonomy in interacting with content and corresponding low learner completion rates (Khalil & Ebner, 2014). Because the course was developed to be a resource for educators as they prepared to teach in the COVID-19 pandemic, learners could pick and choose parts of the course that were relevant to their needs and gain valuable insights without necessarily completing the entire course. This challenge exists across all massive open online courses, as one of their primary affordances is self-paced, self-directed learning (Eisenberg & Fischer, 2014, Zhu & Bonk, 2019). As a result, the actual number of MOOC learners who interact with all course lessons and earn a course certificate is relatively low in comparison to the large number of active learners present in a course (Khalil & Ebner, 2014).

Our data analysis was further hindered by the fact that learners in the Resilient Teaching MOOC were only presented with the *opportunity* to complete reflective digital workbook entries throughout the course. In other words, the completion of workbook entries was not a project requirement for the final assignment. Additionally, given the burden of preparing instructional content for an uncertain academic year, learners may have prioritized other planning efforts over responding to the work of peers and completing a time-consuming, peer-reviewed assignment.

After reflecting on the size of our data set and the possible rationales explaining the smaller than expected sample, we revisited the design of the Resilient Teaching MOOC to survey what scaffolds and directions were present that served to guide learners' use of the digital workbook tool. Our review revealed initial references to the community-oriented nature of the course that were not sustained throughout the course and a basic overview of the digital workbook tool that mentioned the capabilities of learners to share their entries and comment on their peers' shared entries. While these statements could certainly be interpreted by learners that they should make use of the digital workbook and embrace the community ethos by sharing their work and offering input on other's entries, these efforts did not result in the desired outcome conceived of in the provision of the digital workbook as a scaffolding tool.

Implications for Future Research

Our findings lead to a question for instructors and learning designers about what additional support may be needed to help learners realize levels of completeness and quality required to meet assignment objectives, particularly in an open, online learning environment. Future research could focus on the design of the prompts themselves, encouraging instructional teams to pay close attention to the wording of the prompts, with particular attention to aspects of *articulation and reflection* (Quintana, 2004). Furthermore, consideration of additional kinds of scaffolds (i.e., process-oriented scaffolds) and frequency of use is needed to move closer to realizing the desired learner use of the digital workbook as a learning tool (i.e., consistent use and additional efforts to refine and polish workbook entries before submission). Drawing on user-experience design methods (Schmidt et al., 2020), course designers could implement

learner-testing approaches that would elucidate the clarity and effectiveness of the prompts, before the introduction of these "hard scaffolds" into a MOOC. In future research we plan to explore techniques to create a tighter coupling between reflection opportunities and assessments, including using scaffolds to guide learners through formalizing their workbook entries into more complete, formal drafts and how to leverage peer feedback to refine their work. These efforts would allow us to deepen our understanding of how instructors and learning designers can play a role in facilitating self-directed learning in MOOCs.

Declarations
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The authors assert that approval was obtained from an ethics review board (IRB) at the University of Michigan, USA.

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References

Anders, A. (2015). Theories and applications of massive online open courses (MOOCs): The case for hybrid design. *International Review of Research in Open and Distributed Learning, 16*(6), 39–61. https://doi.org/10.19173/irrodl.v16i6.2185

Bali, M. (2014). MOOC pedagogy: Gleaning good practice from existing MOOCs. *Journal of Online Learning and Teaching*, *10*(1), 44.

Beaven, T., Hauck, M., Comas-Quinn, A., Lewis, T., & de los Arcos, B. (2014). MOOCs: Striking the right balance between facilitation and self-determination. *MERLOT Journal of Online Learning and Teaching*, *10*(1), 31-43.

Bonk, C. J., Zhu, M., Kim, M., Xu, S., Sabir, N., & Sari, A. R. (2018). Pushing toward a more personalized MOOC: Exploring instructor selected activities, resources, and technologies for MOOC design and implementation. *International Review of Research in Open and Distributed Learning*, *19*(4). https://doi.org/10.19173/irrodl.v19i4.3439

Brown, A. L., & Campione, J. C. (2002). Communities of learning and thinking, or a context by any other name. *Contemporary issues in teaching and learning*, 120-126.

Bruner, J. (1996). *The culture of education*. Cambridge, MA: Harvard University Press.

Brush, T. A., & Saye, J. W. (2002). A summary of research exploring hard and soft scaffolding for teachers and students using a multimedia supported learning environment. *The Journal of Interactive Online learning*, *1*(2), 1-12.

Clow, D. (2013, April). MOOCs and the funnel of participation. In *Proceedings of the Third International Conference on Learning Analytics and Knowledge* (pp. 185-189). https://doi.org/10.1145/2460296.2460332

Coursera: Take the world's best courses, online. (n.d.). http://www.coursera.org

DeVaney, J., & Quintana, R. (2020, April 15). *Preparing for future disruption: Hybrid, resilient teaching for a new instructional age. Inside Higher Ed.* https://www.insidehighered.com/blogs/learning-innovation/preparing-future-disruption-hybrid-resilient-teaching-new-instructional

Downes, S. (2009, February 24). Connectivist dynamics in communities. http://halfanhour.blogspot.co.uk/2009/02/connectivist-dynamics-in-communities.html

Downes, S. (2008) Places to go: Connectivism & connective knowledge. *Innovate: Journal of Online Education*, 5(1), 6. https://nsuworks.nova.edu/innovate/vol5/iss1/6

Eisenberg, M., & Fischer, G. (2014). MOOCs: A perspective from the learning sciences. In *Proceedings of the 11th International Conference of the Learning Sciences* (ICLS), 190–197. https://doi.dx.org/10.22318/icls2014.190

FemTechNet White Paper Committee: Balsamo, A., Boyer, P., Fernandes, M., Gajjala, R., Irish, S., Junasz, A., Losh, E., Rault, J., & Wexler, L. (2013). *Transforming higher education with distributed open collaborative courses (DOCCs): Feminist pedagogies and networked learning.* FemTechNet. http://femtechnet.newschool.edu/femtechnetwhitepaper/

Ferguson, R., & Sharples, M. (2014). Innovative pedagogy at massive scale: teaching and learning in MOOCs. In *European Conference on Technology Enhanced Learning* (pp. 98-111). Springer. https://doi.org/10.1007/978-3-319-11200-8_8

Fischer, G. (2014). Beyond hype and underestimation: identifying research challenges for the future of MOOCs. *Distance Education*, *35*(2), 149-158. https://doi.org/10.1080/01587919.2014.920752

Garrison, D. R. (1997). Self-directed learning: Toward a comprehensive model. *Adult Education Quarterly*, 48(1), 18–33. https://doi.org/10.1177%2F074171369704800103

Gregori, E. B., Zhang, J., Galván-Fernández, C., & de Asís Fernández-Navarro, F. (2018). Learner support in MOOCs: Identifying variables linked to completion. *Computers & Education*, *122*, 153-168. https://doi.org/10.1016/j.compedu.2018.03.014

Gutiérrez-Rojas, I., Alario-Hoyos, C., Pérez-Sanagustín, M., Leony, D., & Delgado-Kloos, C. (2014). Scaffolding self-learning in MOOCs. *Proceedings of the European MOOC Stakeholder Summit*, *2014*, 43-49.

Håklev, S., & Slotta, J. D. (2017, May). A principled approach to the design of collaborative MOOC curricula. *In European Conference on Massive Open Online Courses* (pp. 58-67). Springer, Cham.

Hodges, C., Moore, S., Lockee, B., Trust, T., & Bond, A. (2020, March 27). *The difference between emergency remote teaching and online learning.* EDUCAUSE Review. https://er.educause.edu/articles/2020/3/the-difference-between-emergency-remote-teaching-and-online-learning

Hollands, F. M. & Tirthali, D. (May 2014). *MOOCs: Expectations and reality*. Full report. Center for Benefit-Cost Studies of Education, Teachers College, Columbia University.

Hsieh, H. F., & Shannon, S. E. (2005). Three approaches to qualitative content analysis. *Qualitative Health Research, 15(9)*, 1277–1288. https://doi.org/10.1177/1049732305276687

Ibrahim, N. I., Bohm, L., Roche, J. S., Stoddard, S. A., Quintana, R. M., Vetter, J., Bennett, J., Costello, B., Carter, P. M., Cunningham, R., & Hashikawa, A. N. (2021). Creating a 'choose your topic' massive open online course: An innovative and flexible approach to delivering injury prevention education. *Medical Education Online*, *26*(1), 1955646. https://doi.org/10.1080/10872981.2021.1955646

Kasch, J., van Rosmalen, P., Löhr, A., Klemke, R., Antonaci, A., & Kalz, M. (2021). Students' perceptions of the peer-feedback experience in MOOCs. *Distance Education*, 42(1), 145-163. https://doi.org/10.1080/01587919.2020.1869522

Khalil, H., & Ebner, M. (2014). MOOCs completion rates and possible methods to improve retention-A literature review. *EdMedia+ innovate learning*, 1305-1313.

Lambert, S. (2015) Reluctant mathematician: Skills-based MOOC scaffolds wide range of learners. *Journal of Interactive Media in Education, 2015(1)*. 21, 1–11. http://dx.doi.org/10.5334/jime.bb

Lane, L. M. (2012, August 15). Three kinds of MOOCs. http://www.lisahistory.net/wordpress/2012/08/three-kinds-of-moocs/

Lave, J. (1991). Situating learning in communities of practice. In L. B. Resnick, J. M. Levine, & S. D. Teasley (Eds.), *Perspectives on socially shared cognition* (pp. 63–82). American Psychological Association. https://doi.org/10.1037/10096-003

Levine, A. (2013, January). ds106: Not a course, not like any MOOC. Educause Review Online, 54–55. http://www.educause.edu/ero/article/ds106-not-course-not-anymooc/

Mackness, J., Waite, M., Roberts, G., & Lovegrove, E. (2013). Learning in a small, task-oriented, connectivist MOOC: Pedagogical issues and implications for higher education. *International Review of Research in Open and Distance Learning, 14*, 140–159. http://www.irrodl.org/index.php/irrodl/article/view/1548/2636

Major, C. H., & Blackmon, S. J. (2016). Massive open online courses: Variations on a new instructional form. *New Directions for Institutional Research*, *2015*(167), 11-25.

McHugh, M. (2012). Interrater reliability: the kappa statistic. *Biochemia Medica, 22*(3). *Croatia: Medicinska Naklada*.

Milikić, N., Gašević, D., & Jovanović, J. (2018). Measuring effects of technology-enabled mirroring scaffolds on self-regulated learning. *IEEE Transactions on Learning Technologies*, *13*(1), 150-163. 10.1109/TLT.2018.2885743

Milligan, C., & Littlejohn, A. (2014). Supporting professional learning in a massive open online course. *International Review of Research in Open and Distributed Learning*, *15*(5), 197-213. https://doi.org/10.19173/irrodl.v15i5.1855

Najafi, H., Rolheiser, C., Harrison, L., & Håklev, S. (2015). University of Toronto instructors' experiences with developing MOOCs. *International Review of Research in Open and Distributed Learning*, *16*(3), 233-255. https://doi.org/10.19173/irrodl.v16i3.2073

Pérez-Álvarez, R. A., Maldonado-Mahauad, J., Sharmsa, K., Sapunar-Opazo, D., & Pérez-Sanagustín, M. (2020). Characterizing learners' engagement in MOOCs: An observational case study using the NoteMyProgress tool for supporting self-regulation. *IEEE Transactions on Learning Technologies*, *13*(4), 676-688. 10.1109/TLT.2020.3003220

Pinto, J. D., Quintana, C., & Quintana, R. M. (2020). Exemplifying computational thinking scenarios in the age of COVID-19: Examining the pandemic's effects in a project-based MOOC. *Computing in Science and Engineering*. 22(6). 91-102. https://doi.org/10.1109/MCSE.2020.3024012I

Plano Clark, V. L., Creswell, J. W. (2011). *Designing and conducting mixed methods research*. SAGE Publications.

Quintana, R. M., Fortman, J., & DeVaney, J. (2021). Advancing an approach of resilient design for learning by designing for extensibility, flexibility, and redundancy (Chapter 4). In C. González, T. Thurston, and K. Lundstrom (Eds.), *Resilient pedagogy: Practical teaching strategies to overcome distance, disruption, and distraction* (pp. 77-92). Utah State University. https://dx.doi.org/10.26079/a516-fb24

Quintana, R. M., Haley, S. R., Magyar, N., & Tan, Y. (2020). *Integrating Learner and User Experience Design: A Bidirectional Approach* (Chapter 12). In Schmidt, M., Tawfik, A., Earnshaw, Y. & Jahnke, I. (Eds.), *Learner and user experience research: An introduction to the field of learning design and technology* (pp. 234-250). EdTechBooks. https://edtechbooks.org/ux/integrating_lxd_and_uxd

Quintana, R. M., Hearn, C. S., Peurach, D. J., & Gabriele, K. (2020). Self-directed, community-supported learning in practice: A case of elevated support (pp. 312-333). In L. Wilton & C. Brett (Eds.). *Handbook on research on online discussion-based teaching methods*. IGI Global.

Reich, J., & Ruipérez-Valiente, J. A. (2019). The MOOC Pivot. *Science*, *363*(6423), 130-131. DOI: 10.1126/science.aav7958

Rohs, M., & Ganz, M. (2015). MOOCs and the claim of education for all: A disillusion by empirical data. *International review of research in open and distributed learning*, 16(6), 1-19. https://doi.org/10.19173/irrodl.v16i6.2033

Roschelle, J. (1997). *Learning in interactive environments: Prior knowledge and new experience* (pp. 37-54). San Francisco, CA, USA: Exploratorium Institute for Inquiry.

Sambe, G., Bouchet, F., & Labat, J.-M. (2018). Towards a conceptual framework to scaffold self-regulation in a MOOC. In C. M. F. Kebe, A. Gueye, & A. Ndiaye (Eds.), *Innovation and interdisciplinary solutions for underserved areas* (Vol. 204, pp. 245–256). https://doi.org/10.1007/978-3-319-72965-7_23

Saye, J. W., & Brush, T. (2002). Scaffolding critical reasoning about history and social issues in multimedia-supported learning environments. *Educational Technology Research and Development*, *50*(3), 77-96.

Scardamalia, M., & Bereiter, C. (2014). Knowledge building and knowledge creation: Theory, pedagogy, and technology. *Cambridge Handbook of the Learning Sciences*, *2*, 397-417.

Shah, D. (2020). By the numbers: MOOCs during the pandemic. *The Report by Class Central*. https://www.classcentral.com/report/mooc-stats-pandemic/

Slotta, J. D., & Najafi, H. (2013). Supporting collaborative knowledge construction with Web 2.0 technologies. In *Emerging technologies for the classroom* (pp. 93-112). Springer, New York, NY.

Take edX On The Go. (2017). edX.

Tappan, R. S., Hedman, L. D., López-Rosado, R., & Roth, H. R. (2020). Checklist-style rubric development for practical examination of clinical skills in entry-level physical therapist education. *Journal of Allied Health*, *49*(3), 202-211.

Thomas, D. R. (2006). A general inductive approach for analyzing qualitative evaluation data. *American Journal of Evaluation, 27*(2), 237-246. https://doi.org/10.1177/1098214005283748

Verstegen, D., Spruijt, A., Dolmans, D., & Van Merriënboer, J. (2015). Problem-based learning in a MOOC: Exploring an innovative instructional design at a large scale. *Proceedings of the CSEDU Conference,* Volume 2 (pp. 369-378). Setúbal, Portugal: Scitepress.

Wood, D., Bruner, J. S., & Ross, G. (1976). The role of tutoring in problem solving. *Child Psychology & Psychiatry & Allied Disciplines*. https://doi.org/10.1111/j.1469-7610.1976.tb00381.x

Zhu, M., & Bonk, C. J. (2019). Designing MOOCs to facilitate participant self-directed learning: An analysis of instructor perspectives and practices. *International Journal of Self-Directed Learning*, 16(2), 39-60.

Zhu, M., & Bonk, C. J. (2019b). Designing MOOCs to facilitate participant self-monitoring for self-directed learning. *Online Learning*, 23(4), 106–134.

Zhu, M. (2021). Enhancing MOOC learners' skills for self-directed learning. *Distance Education*, 42(3), 441-460. https://doi.org/10.1080/01587919.2021.1956302

Zhu, M., Bonk, C. J., Berri, S. (2022). Fostering self-directed learning in MOOCs: Motivation, learning strategies, and instruction. *Online Learning*, 26(1), 153-173. DOI: 10.24059/olj.v26i1.2629

Appendix A
Digital Workbook Prompts Indexed to Culminating Assignment Prompts

The culminating assignment consisted of five separate question prompts. Most of the digital workbook prompts learners completed throughout the course mapped to one of these assignment prompts. These connections are shown below.

Prompt Number	Peer-review prompts for culminating assignment	Corresponding workbook prompt(s) indexed to course content
1	Describe the context of the course for which you are designing.	Looking at Possible Fall Scenarios through a Lens of Diversity, Equity, and Inclusion (Week 1) Considering Your Teaching Context (Week 2)
2	Describe the components of the course you are designing: elements, interconnections, and course purpose.	Defining the Components of a Course (Week 2)
3	Provide a list of course-level learning goals.	Articulating Course Level Learning Goals (Week 2)
4	Taking into account the interactions triangle, explain how you are considering facilitating interactions in your course, including Student-to-content, Student-to-instructor, Student-to-student, Instructor-to-content (optional).	Designing for Interactions in Your Course (Week 2)
5	For interaction you have just articulated, explain how the principles of extensibility, flexibility, and redundancy are informing how you are thinking about facilitating these interactions.	Starting with an MVP (Week 2) Considering the Unknowns (Week 2) Identifying Potential Points of Failure (Week 2) Taking a Look at Resilient Design for Learning Principles as a Whole (Week 3)

Appendix B
Complete Digital Workbook Prompts Indexed to Culminating Assignment Prompt 5

*Prompt 5 read, "*For each interaction you have just articulated, explain how the principles of extensibility, flexibility, and redundancy are informing how you are thinking about facilitating these interactions." *This table includes the digital workbook prompts learners encountered as part of their weekly instruction.*

Corresponding digital workbook prompt(s) indexed to course content	Digital workbook prompt
Starting with an MVP (Week 2)	We have defined designing for extensibility as the ability to foresee changes or additions to your course that may be possible or required. One way to start thinking about that is by considering the idea of the minimum viable product or the MVP. A useful starting point could be to consider approaches you are familiar with and have had good success with in the past. ● *As you think about your course, what might a basic version of your course look like? One that could reasonably function and fulfill the course purpose?* ● *As you think beyond your MVP, what are your thoughts about which existing course elements to expand? What new elements are you considering adding after the MVP is complete?*
Considering the Unknowns (Week 2)	We have defined designing for flexibility as devising alternative strategies so that our course can function in multiple contexts. We've talked about how designing for variability within the learning environment is one way of ensuring that course designs will be able to adapt and respond to changes that may occur in the learning environment. As you think about how your course design will allow for flexible implementation, consider the following questions: ● *When you consider the "unknowns" of your courses' learning environments, what aspects of specific interactions are you concerned about and why?* ● *What is your primary method of facilitating these interactions? (e.g., lecture, seminar, lab, in person consultation)?* ● *How might these need to be refined or modified based on what you do know about the environments in which you will teach?* ● *What alternative approaches have you considered (or tried) that could allow you to successfully facilitate these interactions?*

Identifying Potential Points of Failure (Week 2)	We have defined designing for redundancy as identifying and/or creating interchangeable elements that could function if one or more aspects of the course plan fails due to perturbations in the learning environment.

> ● *How are you considering this idea of redundancy as you plan your course?*

When designing for flexibility we can think about the following kinds of questions:

> ● *When you consider your design plan, can you identify areas that are "brittle" or particularly vulnerable if one or more elements failed?*
> ● *How can you minimize dependence on certain tools or activities so that if those features are lost due to a disruption, your class will still largely work?*
> ● *How might you identify alternative ways of facilitating desired interactions?*

Taking a Look at Resilient Design for Learning Principles as a Whole (Week 3)	The guiding principles of resilient design for learning are intended to be a tool for thinking about your course design. Like most design tools, they are not necessarily meant to be worked through in a linear order. One principle informs another and it may be necessary to revisit one or more multiple times as you work through your course design process.

In previous journal entries, you have considered each principle individually.

Now as you begin to think about putting your course plan together for the peer-graded assignment, describe how you might be thinking about the principles working together:

> ● *What new questions emerged as you worked through each principle? What ideas might you need to revisit?*
> ● *How is one principle informing another?*
> ● *How are you capturing your design ideas and decisions? What forms of representation might be useful to share with your peers?*

If you have created useful representations of your course design plans (e.g., tables, flowcharts), please consider publishing this journal entry to the gallery.

Appendix C
Additional Participant Information

Figure C1
Plot depicting the various professions of the focus participants of the present study.
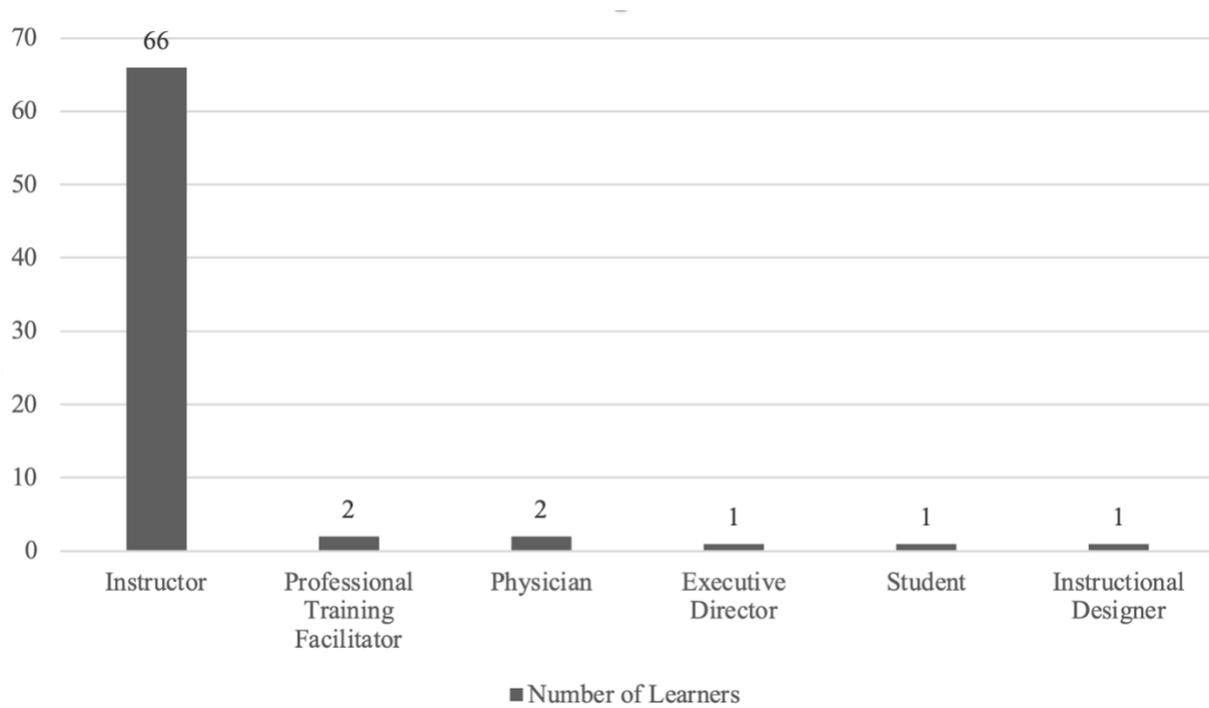
Figure C2
Plot depicting the various subject areas the focus participants of the present study work in.
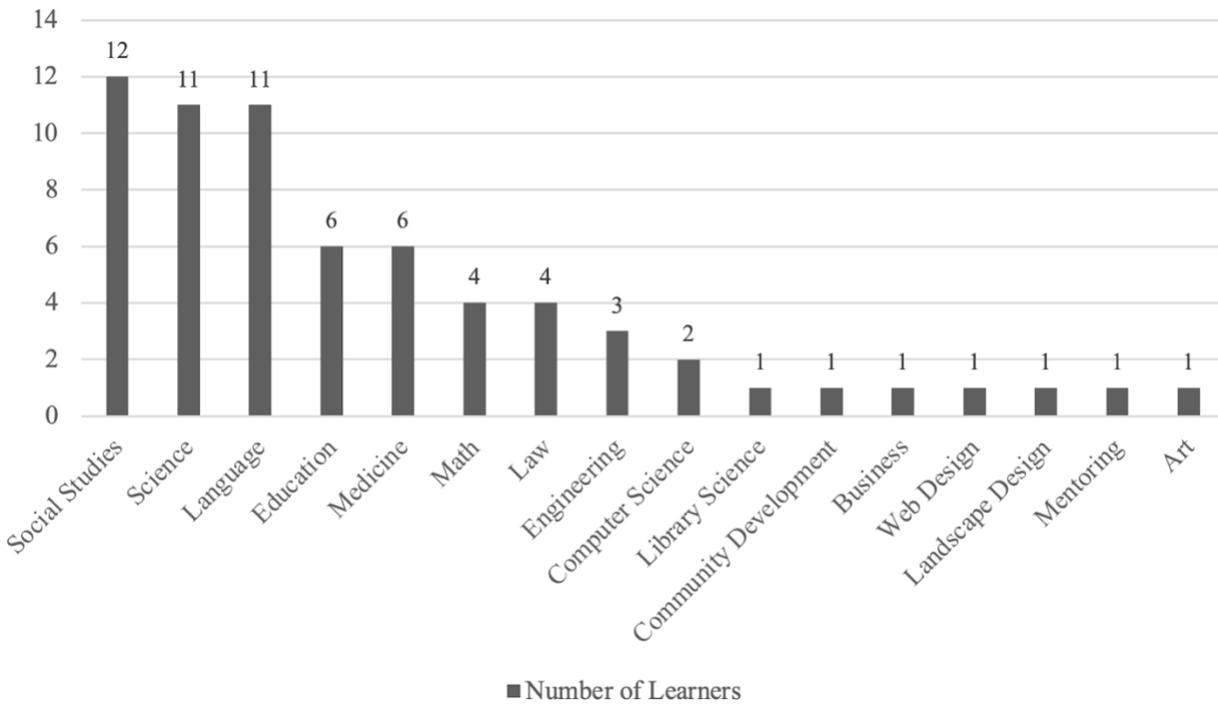

Figure C3
Plot depicting the different professional contexts of the focus participants of the present study.
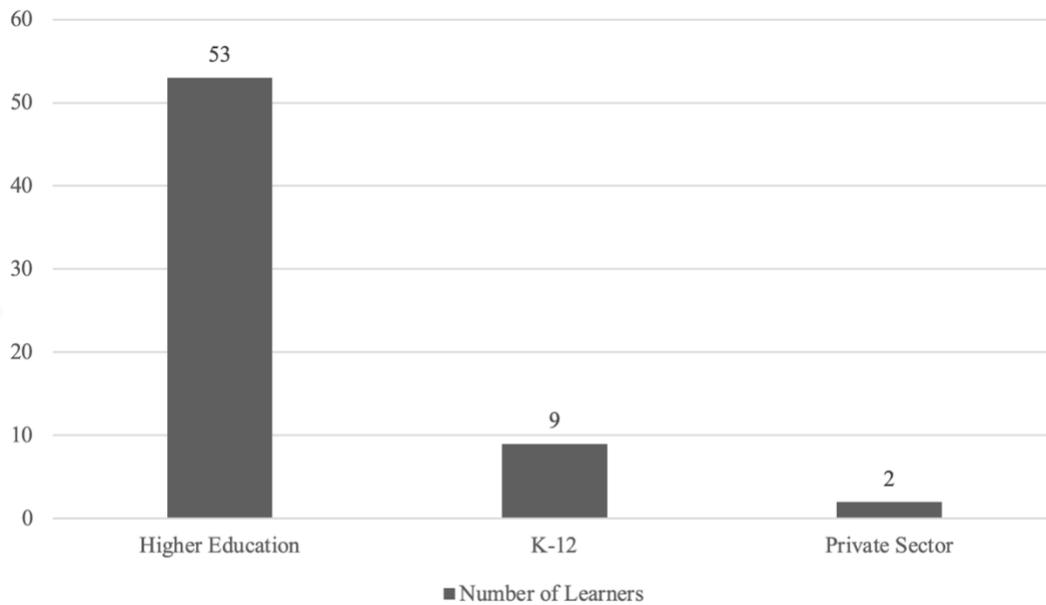
Classroom Community and Time: Comparing Students' Perceptions of Classroom Community in Traditional vs. Accelerated Online Courses

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Abstract

Online educators regularly experiment with ways to create a sense of classroom community in the online courses they design and teach. They do this in part to battle feelings of isolation and loneliness but also to align with prevailing theories of learning (e.g., social constructivism) as well as to mimic idealized in-person face-to-face learning experiences. However, little is known about how well a sense of community is developed in accelerated online courses. Given this, we investigated students' perceptions of classroom community in traditional length online courses (e.g., 15-week courses) and accelerated online courses (e.g., 7-week courses) taught by the same instructors. The results showed that there was not a statistically significant difference in students' perceptions of classroom community between the 15-week and 7-week courses. Students in this study rated the accelerated 7-week courses as having a higher sense of classroom community. In this paper, we present the results of our inquiry. We conclude with the implications of our research on research and practice.

Keywords: classroom community, community, connectedness, online learning, accelerated, social presence

Even before COVID-19, millions of students were taking online courses each year (Allen & Seaman, 2016; Hobson & Puruhito, 2018; Seaman et al., 2018). While reports suggest that students' experiences learning online during COVID-19 were often far from ideal (Hodges et al., 2020; Stewart, 2021), enrollments in online courses and programs are only likely to increase in the coming years (Lowenthal et al., 2021). Many students who might have avoided taking online courses prior to COVID-19 for various reasons found that they liked the convenience of learning anytime, from anywhere. One problem, though, is that research over the years estimates that attrition rates are 10 to 20% higher in online courses than in traditional in-person face-to-face courses (Angelino et al., 2007; Boston et al., 2009; Wladis et al., 2014) and that certain high-risk populations of students might actually perform worse in online courses than in face-to-face courses (Jaggars, 2011; Jaggars & Xu, 2010; Hart et al., 2015). Thus, while student interest in enrolling in online courses and programs might continue to grow (especially compared to enrollments in in-person face-to-face courses and programs), questions remain about how successful this body of students will be learning online over the coming years (Fitzgerald, 2022; Glazier, 2020; Lockee, 2021).

Students drop out of courses and programs for many reasons (Shea & Bidjerano, 2014, 2019). Research, though, suggests that one of these reasons is because of feelings of isolation, loneliness, and an overall sense of disconnectedness (Drouin, 2008; Thomas et al., 2014). Researchers have argued that one way to help students address feelings of isolation and loneliness and in turn persist is through establishing social presence and a sense of classroom community (Boston et al., 2011; Kaufmann & Vallade, 2020; Rovai, 2002b, 2003). However, from its inception, people have questioned the ability to develop social presence and a sense of classroom community in fully online environments, especially those relying predominantly on asynchronous text-based communication (Anderson, 2008; Lowenthal & Dunlap, 2020; Reese, 2015). Part of their concern has always been the lack of visual cues in asynchronous text-based communication (Berge & Collins, 1995; Lowenthal, 2010; Lowenthal & Mulder, 2017); however, critics have also found that the lack of immediacy in this type of communication often leads to misunderstandings and in turn make collaborating online difficult (Watts, 2016).

While researchers have demonstrated over time that social presence and even a sense of classroom community can be developed online, many have agreed that it can take longer to develop when using asynchronous communication alone (Akyol & Garrison, 2008; Tu, 2001; Walther, 1992, 1996). Although previous research has mentioned the need for "time together" to develop a sense of community (McMillan & Davis, 1986; Dawson, 2016), few studies have investigated this variable (see Akyol & Garrison, 2008). This issue of taking extra time to develop a sense of social presence and classroom community could have direct implications for the increasing number of accelerated online courses (e.g., 3-week, 5-week, 7-week) being offered today at colleges and universities (Lowenthal, 2016). Given this, the purpose of this study was to investigate if there was a difference in students' sense of classroom community in traditional length online courses (e.g., 15-week courses) compared to accelerated online courses (e.g., 7-week courses) taught by the same instructor. The following research questions guided this study: (1) Is there a significant difference in the sense of community between students in a 15-week course vs. a 7-week course? (2) What are students' perceptions about the sense of classroom community in their online courses? In this paper, we present the results of our inquiry. We conclude with the implications for research and practice.

Background

During the last 20 to 30 years, educators have increasingly focused on the importance of social interaction and specifically, community in teaching and learning (see Brown & Duguid, 1991; Jonassen, 1995; Lave, 1991; Rogoff, 1994; Wenger, 1999, 2000). Thus, when educators began experimenting with using the internet for teaching and learning in the mid-1980s and 1990s, they were not simply interested in improving correspondence distance education; rather, they wanted to find ways to get groups of students to interact and communicate, and ultimately form a sense of classroom community and learn together at a distance (Gunawardena, 1995; Harasim, 1987, 1990). In the late 1990s, Garrison and his colleagues developed the Community of Inquiry (CoI) framework. Building off the work of Dewey (1933, 1959) and Lipman (1991), they posited that communities of inquiry can be developed when teaching presence, social presence, and cognitive presence are evident (Garrison et al., 1999, 2000; Rourke et al., 1999). Around this same time, researchers started focusing specifically on whether and how learning communities could be formed in an online environment.

Swan and her colleagues published some of the first research focused directly on the development of learning communities in online courses. In one study, Swan et al. (2000) surveyed 1,406 online students in the SUNY Learning Network as well as analyzed the course design of 73 online courses to better understand learning communities. They found that consistent and transparent course design, regular and constructive instructor interaction with students, and active discussions influence the success of online courses. They went on to argue that these three factors in turn help lay the foundation for knowledge-building communities.

Later, drawing from the results of two different studies, Swan (2002) investigated course design features and student immediacy behaviors that influence the social development of learning communities. Building on her previous research, Swan reiterated the importance of clear course structure, interactive instructors, and dynamic discussions but also argued that students use verbal immediacy behaviors--specifically, affective, cohesive, and interactive behaviors--in online discussions to develop a sense of community among classmates.

Around the same time, Rovai (2001, 2002a, 2002b) began researching what he conceptualized as "classroom community." In one of his early studies, Rovai (2001) conducted a mixed-methods case study where he examined course interactions, sense of classroom community, and learner feedback in a five-week fully online graduate course. Rovai found that the sense of classroom community did increase over a five-week course and therefore concluded that online "instructors can create virtual learning environments that promote a sense of classroom community" (p. 45). Rovai also found females were more positive and had a stronger sense of classroom community. In addition, he reported a moderate relationship between classroom community and the number of times someone posted. Rovai (2001) pointed out that other things could impact classroom community, such as instructor writing styles, instructor immediacy, course content, or length of the course. He suggested that future research might investigate how course design and pedagogy influence classroom community.

Shea and his colleagues also conducted a number of studies on learning communities and presence (see Shea, 2006; Shea, Li, Swan, & Pickett, 2005; Swan & Shea, 2005). For instance, Shea et al. (2005) created an instrument (that included Rovai's Classroom Community Scale) to investigate the role of teaching presence in developing a learning community online. Shea et al. found that teaching presence was related to classroom community; more specifically, they explained: "that a strong and active presence on the part of the instructor—one in which she or

he actively guides the discourse—is related to students' sense of both connectedness and learning" (p. 71).

While research suggests that a sense of community is related to student satisfaction and perceived learning (Caskurlu et al., 2021; Chatterjess & Correia, 2020; Shea et al., 2005; Shea 2006; Trespalacios et al., 2021) and can improve the online learning experience (Fiock, 2020), some researchers have focused specifically on how instructors and course designers actually develop a sense of community online. There have been several attempts to identify general recommendations to promote a sense of community in online environments. Early on, Haythornthwaite et al. (2000) suggested that designing opportunities for initial bonding, monitoring and supporting interaction and participation, and providing multiple ways of communication can help promote community. Palloff and Pratt (2007) suggested active interaction, collaborative learning, socially constructed meaning, resource sharing, and expressions of support and encouragement can all help build community. Later, Shackelford and Maxwell (2012) found that introductions, collaborative group projects, contributing personal experiences, entire class online discussions, and exchanging resources all impact students' sense of community. Additionally, Cuthbertson and Falcone (2014) argued that faculty need to provide opportunities for students to regularly be themselves and share their experiences, thoughts, and interests in a relevant way throughout the semester. But all of these community development strategies take time. They take time to facilitate and time to develop, which led some to conclude as Dawson (2006) did that "the formation of a learning community may be influenced by the time required to establish close social relationships among the student cohort." (p. 160).

Despite research like this, questions remain about how things like course duration, course design, instructional strategies, and even instructor disposition might influence students' perceptions of classroom community. For instance, do students perceive a stronger sense of classroom community in traditional length online courses than in accelerated online courses? Are certain courses simply designed better to establish a sense of classroom community regardless of the course duration? Or could it be that certain instructors are more effective at establishing classroom community than others?

Method

This study was grounded in Rovai's (2000, 2002a, 2002b; 2003) work on classroom community. Rovai thought of community in terms of a sense of connectedness that consisted of of cohesion, spirit, trust, and interdependence. He created the Classroom Community Scale (CCS) to measure students' perceptions of classroom community (Rovai, 2002a). The CCS consists of essentially two subscales. There are 10 questions in the connectedness subscale focused on connectedness and 10 questions in the learning subscale focused on learning. Students are asked how they feel about each question using a 5-point Likert scale ranging from strongly agree to strongly disagree. The results are added up to calculate a classroom community score per student.

To investigate the research questions guiding this study, we employed a survey research design (Creswell, 2015). The survey included all 20 questions of the CCS and one open-ended question seeking additional comments on students' perceptions of classroom community. We identified six courses in a fully online Master's of Educational Technology program that were taught during a summer term (7 weeks) and a fall term (15 weeks) by the same instructor prior to the COVID-19 pandemic. After the analysis of the online course contents taught in the summer

and fall, we confirmed that they had the same textbook, course description, learning objectives, and grade scale. We administered the survey at the end of each semester.

We had 86 students complete the survey in the summer and 102 complete the survey in the fall. It was possible that some students could be enrolled in two summer courses or one in the summer and one in the spring. Since the survey was anonymous, we could not verify whether a student took the survey more than once.

Results were downloaded from Qualtrics and imported into SPSS to analyze. Descriptive statistics and frequencies were first calculated. Then an independent-samples t-test was used to compare scores for two different groups (summer versus fall). The data from the open-ended questions were downloaded and analyzed by the first author using a constant comparative technique (Leech & Onwuegbuzie, 2007). This type of analysis is useful when trying to explore and understand the big picture of a phenomenon such as students' perceptions of classroom community. This type of data analysis involves taking a multistage coding process. First descriptive codes are created; then a type of pattern coding is used to group and analyze the data (Saldana, 2016). The first researcher returned to the qualitative analysis months later to review the initial codes, patterns and groupings, and the themes to improve the trustworthiness of the original analysis.

Table 1
Course Titles and Enrollments

Course	Summer Enrollment 7 weeks	Fall Enrollment 15 weeks
EDTECH 501: Introduction to Educational Technology	19	18
EDTECH 502: Creating Educational Websites	12	32
EDTECH 503: Instructional Design	7	8
EDTECH 504: Theoretical Foundations of Educational Technology	10	4
EDTECH 505: Evaluation for Educational Technologists	19	22
EDTECH 541: Integrating Technology in the Classroom	19	18

Results

To answer the first research question, we initially compared the averages of the total sense of classroom community between the summer and fall semesters. The average sense of classroom community of the six courses over the summer was $M = 56.15$, compared to $M = 53.68$ over the fall; 80 is the highest possible score with Rovai's instrument. A t-test showed that there was not a statistically significant difference between the two. Then when looking at the averages across the two subscales, the average connectedness subscale was higher over the summer ($M = 25.69$) than the fall ($M = 23.25$) as was the learning subscale for the summer ($M = 30.46$) compared to the fall ($M = 30.43$).

Table 2
Sense of Classroom Community Summer (7 weeks) vs. Fall (15 weeks)

	Summer Average n = 86	Fall Average n = 102	Total Average n = 188
Sense of Classroom Community	56.15	53.68	54.86
Connectedness Subscale	25.69	23.25	24.42
Learning Subscale	30.46	30.43	30.44

We were then interested in looking at the average classroom community score, as well as connectedness and learning subscale scores across each accelerated 7-week and traditional 15-week course. The total classroom community scores ranged from 52 to 60.33 for the summer 7-week courses and from 47.61 to 60.18 for the fall 15-week courses. EDTECH 502 and EDTECH 505 had the highest overall scores for both semesters (see Table 3).

Table 3
Comparison of Course by Course Summer (7 weeks) vs. Fall (15 weeks)

		Summer				Fall		
	n	Classroom Community	Connectedness	Learning	n	Classroom Community	Connectedness	Learning
EDTECH501	19	54.74	25.42	29.32	18	47.61	20.72	26.89
EDTECH502	12	60.33	27.17	33.17	32	57.47	23.44	34.03
EDTECH503	7	53.14	24	29.14	8	49.38	23.13	26.25
EDTECH504	10	52	23.3	28.7	4	50.75	21.75	29
EDTECH505	19	57.68	26.74	30.95	22	60.18	27.41	32.77
EDTECH541	19	52.53	23.42	29.11	18	47.61	20.72	26.89

Finally, we were interested in looking at the results by question per term to identify which items students felt the strongest about—in other words, which items did they rate the highest vs. the lowest. Overall results in many ways across the accelerated summer 7-week term and the traditional fall 15-week term mirrored each other (see Table 4). For instance, with the connectedness subscale, students reported the strongest agreement with the following:
- they did not feel isolated[1] ($M = 2.81$)
- they trusted others in the course ($M = 2.78$)
- they felt confident others will support them ($M = 2.78$)

However, they then reported the strongest disagreement with the following:
- they feel connected to others in the course ($M = 2.29$)
- they thought members of the course depended on them ($M = 1.78$)
- the course felt like a family ($M = 1.69$)

See Table 4 for more comparisons.

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[1] Rovai created some questions like this one to be reversed during analysis to create a total score.

Table 4

A Comparison of Responses per Question on the Classroom Community Scale

Questions	Summer M	Fall M	Combined M
Connectedness Subscale			
I feel that students in this course care about each other	2.80	2.61	2.70
I feel connected to others in this course	2.49	2.11	2.29
I do not feel a spirit of community	2.63	2.40	2.51
I feel that this course is like a family	1.82	1.58	1.69
I feel isolated in this course	2.92	2.70	2.81
I trust others in this course	2.83	2.74	2.78
I feel that I can rely on others in this course	2.72	2.44	2.57
I feel that members of this course depend on me	2.03	1.54	1.78
I feel uncertain about others in this course	2.71	2.49	2.60
I feel confident that others will support me	2.82	2.75	2.78
Learning Subscale			
I feel that I am encouraged to ask questions	3.22	3.25	3.23
I feel that it is hard to get help when I have a question	3.15	3.15	3.15
I feel that I receive timely feedback	3.27	3.34	3.31
I feel uneasy exposing gaps in my understanding	2.64	2.66	2.65
I feel reluctant to speak openly	2.94	2.88	2.91
I feel that this course results in only modest learning	2.95	2.83	2.89
I feel that other students do not help me learn	2.86	2.85	2.86
I feel that I am given ample opportunities to learn	3.17	3.19	3.18
I feel that my educational needs are not being met	3.19	3.14	3.16
I feel that this course does not promote a desire to learn	3.17	3.21	3.19

To answer the second research questions about the students' perceptions about the sense of community in their online course, the following themes emerged from the open-ended data.

Theme 1: Classroom community is not necessarily dependent on every student in a class

Participants in this study talked about how there were students who participated a lot and were, in turn present, trusting, and helpful and those who participated very little and appeared to do the bare minimum and therefore did not appear present. Participants described how a sense of community can still develop even when some in class appeared disinterested or absent thus suggesting that a sense of classroom community is not dependent on every student feeling connected. The following comment capture this idea:

> There were a group of 6 students that were trustworthy and reliable in the course who created a community… The rest of the class was unreliable…

Theme 2: Interest in developing a sense of classroom community varies by student, course, and context and can feel forced or artificial at times

Students have busy lives with many competing priorities. Adult learners completing a professional graduate degree also often have busy careers, often with a strong professional network already. Some participants described simply having no interest in developing a sense of classroom community with a bunch of strangers, regardless of the format. Others talked about how the workload of a specific course and/or current competing priorities outside of class could influence the degree to which they have time and interest in developing a sense of classroom community. And finally, others talked about how the nature of the assignments and/or the sheer fact that they were required to interact and discuss with their peers simply felt forced and artificial and in turn hampered any real sense of classroom community from developing. The following quotes capture this theme:

> I am not looking for them to be my new best friends or family just classmates. ... It seems like a sense of community is difficult to pull off in this setting, but I'm not sure that is a bad thing. I don't find a sense of belonging as rewarding as the knowledge I gained in this course. Learning is paramount, a sense of belonging is simply a bonus.

> I would not expect, nor would I want, a 15-week class to feel like a family, and I wouldn't expect to come away from such a class feeling real "trust" in classmates...many of these people are strangers when we begin the class, and many will be strangers at the end of class (even in a F2F setting). The feeling of "caring" and "connectedness" are, in my opinion, superficial and based on whether it is convenient to be connected in any classroom setting.

> I feel that course members provide feedback that's helpful and genuine, but the sense of community feels somewhat artificial because students are required to participate in order to receive credit. I think the best times that I've noticed a sense of community is when students work on project in small groups. Communities can also be established when the same students are in same course for more than one occasion.

Theme 3: Classroom community depends on intentional design, encouragement, and active facilitation

Participants in this study described how there were things an instructor can do to help develop a sense of classroom community as well as things an instructor can do to help thwart a sense of classroom community. For instance, they talked about how workload, the structure and focus of discussions, faculty participation and encouragement, and the types of assignments can impact the development of and their perceptions of a sense of classroom community. Some described how the way a course is designed and set up can highlight how an instructor values community development and can set the stage for the rest of the semester. They talked about how discussions in some courses felt like busywork, where students and the instructor were just checking the boxes off a to-do list, whereas at other times they felt relevant, and meaningful, with students and the instructor actively and genuinely engaged. Others talked about the power of group work and small group discussions in developing a sense of community when they find themselves working with a good group of like-minded motivated students. The following quotes capture these sentiments:

There were no class introductions in the beginning of the course, and because of that, everything felt very disjointed.

The structure of the discussions were set up in a way that I felt increased participation and dialogue which made for a stronger community feel than I have experienced in other classes.

There was no sense of community, in spite of the fact that we were required to comment on each other's posts… was entirely non-personal in nature. We weren't encouraged to get to know each other, and nobody seemed to feel compelled to try.

The success of online community … was due to the dedication of Dr. Smith who insisted to help us all and gave us a sense of belonging. In addition to the well designed forum rubric … [that] encouraged us all to participate and help each other.

Discussion

Prior to COVID-19, about a third of students took at least one course online each year (Seaman et al., 2018). However, almost overnight, the COVID-19 pandemic and the safety measures enacted forced nearly every student in the United States alone to complete coursework in some type of remote, blended, and/or online format. While students' experiences learning online varied, many believe that this new, even though forced, experience of learning online will likely result in more students opting for this option over the coming years.

Past research suggests that not all students are successful in learning online. Students have reported feeling isolated and alone. Researchers, though, have argued that developing a sense of classroom community can combat feelings of isolation and loneliness and in turn help students persist and to be successful learning online (Ahmady et al., 2018; Boston et al., 2009; Gerad et al., 2021; Fisher & Baird, 2005; Rovai, 2002b; Trespalacios & Uribe-Florez, 2020). However, despite online educators regular mislabeling any and all online courses as "learning communities" or "communities of inquiry" (see Lowenthal & Snelson, 2017; Trespalacios et al. 2021), we contend that developing a sense of classroom community is not common and actually more difficult than many believe (see Phirangee & Malec, 2017). As Rovai (2002) and others have illustrated, it takes intentional design and facilitation for a sense of classroom community to emerge. Further, it begins with regular interaction and the development and establishment of social presence with members of a course (see Lowenthal & Snelson, 2017; Picciano, 2002; Rovai, 2000). However, situational factors (e.g., personal dispositions, class duration, class size, opportunities for future interactions in subsequent courses) as well as the bounded nature of online courses (see Wilson et al., 2004) can all further influence its development. We were particularly interested in how time might influence students' perceptions of classroom community.

Our results illustrated that there was not a statistically significant difference between students' perceptions of classroom community in accelerated 7-week courses vs. traditional 15-week courses taught by the same instructors. In fact, students' perceptions of classroom community were slightly higher during the summer ($M = 25.69$) than in the fall ($M = 23.25$). This finding contradicts earlier research that suggests that developing a sense of social presence and collaboration—the building blocks for classroom community—takes longer online using

asynchronous text-based communication (Akyol & Garrison, 2008; Walther 1992, 1996). At the same time, prior research has shown that social presence could be developed in accelerated courses (Lowenthal, 2016; Soles & Maduli-Williams, 2019; Zajac & Lane, 2020), which could have implications for the time needed for a sense of classroom community to develop and emerge. Questions remain though how much social presence is needed to help develop a sense of classroom community as well as how much of a sense of connectedness, for instance with Rovai's classroom community subscale, is needed for an online course to feel like a classroom community.

The fact that students had even higher perceptions of classroom community over the summer could simply be due to instructors and students becoming more literate and adept with electronically mediated discourse. As people spend more time working, learning, and even socializing online (often with strangers), they are likely to get more successful with communicating online, which in turn might result in students feeling less isolated and alone when taking online courses. Further, accelerated courses could also encourage/require instructors and students to dedicate more time to the course that in turn could help speed up the building blocks for a sense of classroom community to emerge.

We also found that the same instructors, teaching the same courses had the highest classroom community scores across both the summer 7-week and fall 15-week semesters. This could highlight how well-designed courses and/or consistent and skilled facilitation are more important than course duration to develop a sense of classroom community. However, it could also point to the influence of an instructor's personality or disposition to shape students' sense of social presence and classroom community (see Trespalacios & Lowenthal, 2019).

But the findings also might support the notion that every student sees the need or finds the importance to develop a sense of classroom community differently. Students in this program have full lives and professions. Further, related to earlier findings about social presence, students' interest in developing a sense of connectedness or community might be influenced by students' expectations of how they might end up interacting with students in future courses and/or their profession (see Lowenthal & Dunlap, 2018).

Last but not least, there could simply be issues with how we conceptualize classroom community and/or how we measure it. For instance, Rovai (2002) grounded his work on a psychological conception of communication. He included questions such as "I feel that this course is like a family" which might demonstrate a bias and/or limited perspective. Many people might not see family as a positive metaphor for connectedness.

Conclusions

Our results should not be generalized to a larger population due to the small sample size. Additional research is needed to see how time, and specifically accelerated courses, influence student interaction, social presence, and classroom community. The results of our study point to the need to better understand which types of instructional strategies and course designs help establish a sense of classroom community in online courses—especially those relying predominantly, if not solely, on text-based asynchronous communication. Future research should investigate further how certain types of communication influence interaction, communication, and community development. At the same time, researchers and practitioners alike would benefit from a new instrument to measure classroom community. Rovai created his instrument over 20 years ago. He also worked and studied classroom community primarily in a private religious institution. It is time to develop a new instrument to measure classroom community.

Declarations
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The authors assert that approval was obtained from an ethics review board (IRB) at Boise State University, USA.

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References

Ahmady, S., Kohan, N., Bagherzadeh, R., Rakshhani, T., & Shahabi, M. (2018). Validity testing of classroom community scale in virtual environment learning: A cross sectional study. *Annals of Medicine and Surgery*, *36*, 256–260. http://dx.doi.org/10.1016/j.amsu.2018.08.021

Akyol, Z., & Garrison, D. R. (2008). The development of a community of inquiry over time in an online course: Understanding the progression and integration of social, cognitive and teaching presence. *Journal of Asynchronous Learning Networks*, *12*, 3–22. http://dx.doi.org/10.24059/olj.v12i3-4.1680

Allen, I. E., & Seaman, J. (2016). *Online report card: Tracking online education in the United States*. Babson Survey Research Group & Quahog Research Group. http://onlinelearningsurvey.com/ reports/onlinereportcard.pdf

Angelino, L. M., Williams, F. K., & Natvig, D. (2007). Strategies to engage online students and reduce attrition rates. *The Journal of Educators Online, 4*(2), 1–14. http://dx.doi.org/10.9743/JEO.2007.2.1

Akyol, Z., & Garrison, D. R. (2008). The development of a community of inquiry over time in an online course: Understanding the progression and integration of social, cognitive and teaching presence. *Journal of Asynchronous Learning Networks*, *12*, 3–22. http://dx.doi.org/10.24059/olj.v12i3-4.1680

Anderson, T. (2008). *The theory and practice of online learning* (2nd ed.). AU Press.

Berge, Z., & Collins, M. (1995). *Computer-mediated communication and the online classroom: Overview and perspectives* (Vol. 1). Hampton Press.

Boston, W., Díaz, S. R., Gibson, A. M., Ice, P., Richardson, J., & Swan, K. (2009). An exploration of the relationship between indicators of the community of inquiry framework and retention in online programs. *Journal of Asynchronous Learning Networks, 13*(3), 67–83. http://dx.doi.org/10.24059/olj.v13i3.1657

Boston, W., Ice, P., & Gibson, A. (2011). Comprehensive assessment of student retention in online learning environments. *Online Journal of Distance Learning Administration, 14*(1). http://www.westga.edu/~distance/ojdla/spring141/boston_ice_gibson141.pdf

Brown, J. S., & Duguid, P. (1991). Organizational learning and communities-of-practice: Toward a unified view of working, learning, and innovation. *Organization Science*, *2*(1), 40–57. http://dx.doi.org/10.1287/orsc.2.1.40

Cameron, B. A., Morgan, K., Williams, K. C., & Kostelecky, K. L. (2009). Group Projects: Student perceptions of the relationship between social tasks and a sense of community in online group work. *American Journal of Distance Education, 23*(1), 20–33. http://dx.doi.org/10.1080/08923640802664466

Caskurlu, S., Richardson, J. C., Maeda, Y., & Kozan, K. (2021). The qualitative evidence behind the factors impacting online learning experiences as informed by the community of inquiry framework: A thematic synthesis. *Computers & Education*, *165*, 104111. https://doi.org./10.1016/j.compedu.2020.104111

Chatterjee, R., & Correia, A. P. (2020). Online students' attitudes toward collaborative learning and sense of community. *American Journal of Distance Education*, *34*(1), 53–68. https://doi.org/10.1080/08923647.2020.1703479

Cresswell, J. W. (2012). *Educational research: Planning, conducting, and evaluating quantitative and qualitative research* (5th ed.). Pearson.

Dawson, S. (2006). A study of the relationship between student communication interaction and sense of community. *Internet and Higher Education, 9*(3), 153–162. http://dx.doi.org/10.1016/j.iheduc.2006.06.007

Dewey, J. (1933). *How we think*. D.C. Heath and Company.

Dewey, J. (1959). *Dewey on education*. Columbia University Press.

Drouin, M. A. (2008). The relationship between students' perceived sense of community and satisfaction, achievement, and retention in an online course. *Quarterly Review of Distance Education*, *9*(3), 267–284.

Fiock, H. (2020). Designing a community of inquiry in online courses. *The International Review of Research in Open and Distributed Learning, 21*(1), 135–153. https://doi.org/10.19173/irrodl.v20i5.3985

Fisher, M., & Baird, D.E. (2005). Online learning design that fosters student support, self-regulation, and retention. *Campus-Wide Information Systems, 22*(2), 88–107. https://doi.org/10.1108/10650740510587100

Fitzgerald, M. (2022, February). How online learning is reshaping higher education. *U.S. News and World Report*. https://www.usnews.com/news/education-news/articles/2022-02-15/how-online-learning-is-reshaping-higher-education

Garrison, D. R., Anderson, T., & Archer, W. (1999). Critical inquiry in a text-based environment: Computer conferencing in higher education. *Internet and Higher Education*, *2*(2–3), 87–105. https://doi.org/10.1016/S1096-7516(00)00016-6

Gerard, T. L., Brathwaite, S. N., Lawrence, J. H., & Barber, W. S. (2021). Examining the importance of community & connections in online learning. *Journal of Educational Informatics*, *2*(2), 3–16.

Glazier, R. A. (2020, July). A shift to online classes this fall could lead to a retention crisis. *EdSurge*. https://www.edsurge.com/news/2020-07-06-a-shift-to-online-classes-this-fall-could-lead-to-a-retention-crisis

Harasim, L. (1987). Teaching and learning on-line: Issues in computer-mediated graduate courses. *Canadian Journal of Educational Communication, 16*(2), 117–135. http://dx.doi.org/10.21432/T2TK6K

Harasim, L. (1990). *Online education: Perspectives on a new environment*. Greenwood Publishing.

Hart, C. M. D., Friedmann, E. A. Z., & Hill, M. (2015). *Online course-taking and student outcomes in California community colleges*. [Conference presentation]. American Educational Research Association, Chicago, IL, United States.

Hobson, T. D., & Puruhito, K. K. (2018). Going the distance: Online course performance and motivation of distance learning students. *Online Learning*, *22*(4), 129–140. http://dx.doi.org/10.24059/olj.v22i4.1516

Hodges, C., Moore, S., Lockee, B., Trust, T., & Bond, A. (2020, March 27). The difference between emergency remote teaching and online learning. *EDUCAUSE Review*. https://er.educause.edu/articles/2020/3/the-difference-between-emergency-remote-teaching-and-online-learning

Jaggars, S. S. (2011). *Online learning: Does it help low-income and underprepared students?* [CCRC Working Paper No. 26, Assessment of Evidence Series]. Columbia University.

Jaggars, S. S., & Xu, D. (2010). *Online learning in the Virginia Community College system*. Columbia University.

Jonassen, D. H. (1995). Supporting communities of learners with technology: A vision for integrating technology with learning in schools. *Educational Technology, 35*(4), 60–63.

Kaufmann, R., & Vallade, J. I. (2020). Exploring connections in the online learning environment: student perceptions of rapport, climate, and loneliness. *Interactive Learning Environments*, 1–15. http://dx.doi.org/10.1080/10494820.2020.1749670

Kirwan, J. R., & Roumell, E. A. (2015). Building a conceptual framework for online educator dispositions. *Journal of Educators Online*, *12*(1), 30–61. http://dx.doi.org/10.9743/JEO.2015.1.7

Lave, J. (1991). Situated learning in communities of practice. In L. B. Resnick, J. M. Levine, & S. D. Teasley (Eds.), *Perspectives on socially shared cognition* (pp. 63–82). American Psychological Association.

Leech, N. L., & Onwuegbuzie, A. J. (2007). An array of qualitative data analysis tools: A call for data analysis triangulation. *School Psychology Quarterly*, *22*(4), 557. http://dx.doi.org/10.1037/1045-3830.22.4.557

Lipman, M. (1991). *Thinking in education*. Cambridge University Press.

Lockee, B. B. (2021). Online education in the post-COVID era. *Nature Electronics, 4*, 5–6. https://doi.org/10.1038/s41928-020-00534-0

Lowenthal, P. R. (2016). A mixed methods examination of instructor social presence in accelerated online courses. In L. Kyei-Blankson, J. Blankson, E. Ntuli, & C. Agyeman (Eds.), *Handbook of research on strategic management of interaction, presence, and participation in online courses* (pp. 147–159). IGI Global.

Lowenthal, P. R., & Dunlap, J. C. (2018). Investigating students' perceptions of instructional strategies to establish social presence. *Distance Education, 39*(3), 281–298. https://doi.org/10.1080/01587919.2018.1476844

Lowenthal, P. R., & Dunlap, J. C. (2020). Social presence and online discussions: A mixed method investigation. *Distance Education, 41*(4), 490–514. https://doi.org/10.1080/01587919.2020.1821603

Lowenthal, P. R., & Mulder, D. (2017). Social presence and communication technologies: Tales of trial and error. In A. Whiteside, A. Garrett Dikkers, & K. Swan, (Eds.), *Social presence in online learning: Multiple perspectives on practice and research* (pp. 32–44). Stylus.

Lowenthal, P. R., & Snelson, C. (2017). In search of a better understanding of social presence: An investigation into how researchers define social presence. *Distance Education, 38*(2), 1–19. https://doi.org/10.1080/01587919.2017.1324727

McMillan, D. W., & Chavis, D. M. (1986). Sense of community: A definition and theory. *Journal of Community and Psychology, 14*, 6–23.

Moallem, M. (2015). The impact of synchronous and asynchronous communication tools on learner self-regulation, social presence, immediacy, intimacy and satisfaction in collaborative online learning. *Online Journal of Distance Education and e-Learning*, *3*(3), 55–77.

Ouzts, K. (2006). Sense of community in online courses. *Quarterly Review of Distance Education, 7*(3), 285–296.

Phirangee, K., & Malec, A. (2017). Othering in online learning: An examination of social presence, identity, and sense of community. *Distance Education*, *38*(2), 160–172. http://dx.doi.org/10.1080/01587919.2017.1322457

Picciano, A.G. (2002). Beyond student perceptions: Issues of interaction, presence and performance in an online course. *Journal of Asynchronous Learning Networks, 6*(1), 21–40. http://dx.doi.org/10.24059/olj.v6i1.1870

Ragusa, A. T., & Crampton, A. (2018). Sense of connection, identity and academic success in distance education: Sociologically exploring online learning environments. *Rural Society*, *27*(2), 125–142. http://dx.doi.org/10.1080/10371656.2018.1472914

Reese, S. A. (2015). Online learning environments in higher education: Connectivism vs. dissociation. *Education and Information Technologies*, *20*(3), 579–588. http://dx.doi.org/10.1007/s10639-013-9303-7

Rogoff, B. (1994). Developing understanding of the idea of communities of learners. *Mind, Culture, and Activity*, *1*(4), 209–229.

Rourke, L., Anderson, T., Garrison, D. R., & Archer, W. (1999). Assessing social presence in asynchronous text-based computer conferencing. *Journal of Distance Education*, *14*(2), 50–71.

Rovai, A. P. (2000). Building and sustaining community in asynchronous learning networks. *Internet and Higher Education*, *3*(4), 285–297. http://dx.doi.org/10.1016/S1096-7516(01)00037-9

Rovai, A. P. (2002a). Development of an instrument to measure classroom community. *Internet and Higher Education, 5*, 197–211. http://dx.doi.org/10.1016/S1096-7516(02)00102-1

Rovai, A. P. (2002b). Sense of community, perceived cognitive learning, and persistence in asynchronous learning networks. *Internet and Higher Education*, *5*(4), 319–332. http://dx.doi.org/10.1016/S1096-7516(02)00130-6

Rovai, A. P. (2003). Strategies for grading online discussions: Effects on discussions and classroom community in Internet-based university courses. *Journal of Computing in Higher Education*, *15*(1), 89–107. http://dx.doi.org/10.1007/BF02940854

Saldana, J. (2016). *The coding manual for qualitative researchers* (3rd ed.). SAGE.

Seaman, J. E., Allen, I. E., & Seaman, J. (2018). *Grade increase: Tracking distance education in the United States*. Babson Survey Research Group.

Shea, P., & Bidjerano, T. (2014). Does online learning impede degree completion? A national study of community college students. *Computers & Education*, *75*, 103–111. http://dx.doi.org/10.1016/j.compedu.2014.02.009

Shea, P., & Bidjerano, T. (2019). Effects of online course load on degree completion, transfer, and dropout among community college students of the state university of New York. *Online Learning*, *23*(4), 6–22. http://dx.doi.org/10.24059/olj.v23i4.1364

Shen, D., Nuankhieo, P., Huang, X., Amelung, C., & Lafey, J. (2008). Using social network analysis to understand sense of community in an online learning environment. *Journal of Educational Computing Research, 39*(1), 17–36. http://dx.doi.org/10.2190/EC.39.1.b

Soles, B., & Maduli-Williams, D. (2019). Student perceptions of an accelerated online master's in education administration program through the lens of social presence. *Educational Leadership and Administration: Teaching and Program Development*, *30*, 56–82.

Stewart, W. H. (2021). A global crash-course in teaching and learning online: A thematic review of empirical Emergency Remote Teaching (ERT) studies in higher education during Year 1 of COVID-19. *Open Praxis*, *13*(1), 89–102. http://dx.doi.org/10.5944/openpraxis.13.1.1177

Swan, K. (2002). Building learning communities in online courses: The importance of interaction. *Education Communication and Information, 2*(1), 23–49. http://dx.doi.org/10.1080/1463631022000005016

Thomas, L., Herbert, J., & Teras, M. (2014). A sense of belonging to enhance, participation, success and retention in online programs. *The International Journal of the First Year in Higher Education, 5*(2), 69–80. http://dx.doi.org/10.5204/intjfyhe.v5i2.233

Trespalacios, J., & Lowenthal, P. R. (2019). What do they really like? An investigation of students' perceptions of their coursework in a fully online educational technology program. *Australasian Journal of Educational Technology*, *35*(5), 60–78. https://doi.org/10.14742/ajet.4364

Trespalacios, J., Snelson, C., Lowenthal, P. R., Uribe-Florez, L., & Perkins, R. (2021). Community and connectedness in online higher education: A scoping review. *Distance Education*, *42*(1), 5–21. https://doi.org/10.1080/01587919.2020.1869524

Trespalacios, J., & Uribe-Florez, L. J. (2020). Developing online sense of community: Graduate students' experiences and perceptions. *Turkish Online Journal of Distance Education*, *21*(1), 57–72. http://dx.doi.org/10.17718/tojde.690340

Tu, C. H. (2001). How Chinese perceive social presence: An examination of interaction in online learning environment. *Educational Media International*, *38*(1), 45–60. http://dx.doi.org/10.1080/09523980010021235

Venable, M. (2011, December). *Who is the instructor? Developing social presence in an online course*. Online College.org. http://www.onlinecollege.org/2011/12/27/who-is-the-instructor-developing-social-presence-in-an-online-course/

Walther, J. B. (1992). Interpersonal effects in computer-mediated interaction: A relational perspective. *Communication Research, 19*, 52–90. http://dx.doi.org/10.1177/009365092019001003

Walther, J. B. (1996). Computer-mediated communication impersonal, interpersonal, and hyperpersonal interaction. *Communication Research, 23*(1), 3–43. https://doi.org/10.1177/009365096023001001

Watts, L. (2016). Synchronous and asynchronous communication in distance learning: A review of the literature. *Quarterly Review of Distance Education, 17*(1), 23–32.

Welch, A., & Napoleon, L. (2015). Professional teaching dispositions of online instructors: Why they matter. *Procedia-Social and Behavioral Sciences*, *171*, 584–589. http://dx.doi.org/10.1016/j.sbspro.2015.01.164

Wenger, E. (1999). *Communities of practice: learning, meaning, and identity*. Cambridge University Press.

Wenger, E. (2000). Communities of practice and social learning systems. *Organization, 7*(2), 225–246. http://dx.doi.org/10.1177/135050840072002

Wilson, B. G., Ludwig-Hardman, S., Thornam, C. L., & Dunlap, J. C. (2004). Bounded community: Designing and facilitating learning communities in formal courses. *International Review of Research in Open and Distributed Learning*, *5*(3), 1–22. http://dx.doi.org/10.19173/irrodl.v5i3.204

Wladis, C., Wladis, K., & Hachey, A. C. (2014). The role of enrollment choice in online education: Course selection rationale and course difficulty as factors affecting retention. *Online Learning*, *18*(3). http://dx.doi.org/10.24059/olj.v18i3.391

Zajac, L. K., & Lane, A. J. (2020). Student perceptions of faculty presence and caring in accelerated online courses. *Quarterly Review of Distance Education*, *21*(2), 67–78.

Relationship Between Metacognition and Online Community of Inquiry in an Online Case-Based Course

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Abstract
This study explored students' perceived metacognition (self-regulation and co-regulation) in relation to the online presence within the Community of Inquiry (CoI) framework in an online case-based instruction (CBI) course. Forty-seven online graduate students enrolled in an instructional design course participated in the study. Data were collected through CoI survey instrument and shared metacognition questionnaire online survey. The findings revealed that students perceived cognitive presence is higher and less variable among three online presences and metacognition in online CBI. The correlation between two interdependent dimensions of metacognition (self-regulation and co-regulation) was significantly high. Also, co-regulation showed stronger relationships with the three online presences (social, teaching, and cognitive) than self-regulation. Additionally, social presence demonstrated the strongest association with both self-regulation and co-regulation, followed by cognitive presence. These results suggest that students with higher perceived social presence tend to have high metacognition. However, students with higher perceived teaching presence are relatively less likely (or unlikely) to have higher metacognition as teaching presence was found to be the most variable among students, which means that teaching presence was perceived differently.

Keywords: online case-based instruction, metacognition, Community of Inquiry, self-regulation, co-regulation

There is a growing need to understand the process of collaborative thinking and learning in an increasingly connected world (Garrison & Akyol, 2015). The Community of Inquiry (CoI) framework has the capability of capturing the collaborative construction of personally meaningful and shared understanding in the online community of learners (Garrison, 2022). The CoI framework consists of three overlapping presences: cognitive presence, social presence, and teaching presence. These provide the theoretical and methodological tools to explore the complexities of metacognition in collaborative and purposeful learning environments (Garrison et al., 2010; Garrison & Akyol, 2015). One of the core elements of the CoI is the development of students' critical thinking skills focused on the construction of individual (self) and shared (others) understanding (Garrison, 2022). This element is known as cognitive presence that guides the construction of meaning through reflection and discourse (Garrison et al., 2001). Cognitive presence is operationalized through the Practical Inquiry model that supports the dynamics of reflective thinking and a collaborative inquiry process (Garrison et al., 2001). Second element, social presence that is defined as the ability to project oneself as an actual person both socially and emotionally in an online environment (Garrison et al., 2000). Finally, the third element is teaching presence that is defined as "the design, facilitation, and direction of cognitive and social processes for the purpose of realizing personally meaningful and educationally worthwhile learning outcomes" (Anderson et al., 2001, p. 5).

To enhance the quality of online courses and to create a meaningful experience for students, it is important to understand shared learning environments and strategies that can support the development of students' metacognitive processes. In an online CoI, metacognition is defined as a set of higher knowledge and skills to monitor and regulate cognitive processes of self and others (Garrison & Akyol, 2015). Metacognition is a required cognitive ability to achieve deep and meaningful learning that must be viewed from both an individual and social perspective (Garrison & Akyol, 2015). Metacognition within the online CoI is central to the cognitive presence and collaborative inquiry process. Moreover, metacognition becomes shared because thinking and learning are collaborative within the online CoI (Garrison, 2022). However, according to Garrison (2022), the role of metacognition in developing the necessary awareness and regulation for responsible thinking and learning in shared learning environments has not been emphasized enough.

Research suggests that understanding how metacognition manifests in a shared learning environment can help select effective instructional strategies to guide deep and meaningful learning outcomes (Garrison, 2022). One of such instructional strategies can be considered case-based instruction (CBI). Studies found that CBI can help in facilitating deep and meaningful learning through shared collaborative experiences (Koehler et al., 2022; Sadaf et al., 2021). CBI provides favorable conditions where students can be aware of (monitor) and regulate (manage) thinking through the shared inquiry processes (Koehler at al., 2020). Within the CBI, students usually begin by understanding the case problems from their individual perspectives. Following Garrison (2022), this phase can be defined as self-regulation because it consists of learners' self-awareness (monitoring) and self-regulation (managing) of their own cognition. Only after individual understanding of case problems, learners can get a deeper understanding and connections with the shared collaborative knowledge (social perspectives or others). This CBI phase can be defined as monitoring and managing a complex shared learning dynamic or co-regulated learning (Akyol & Garrison, 2011; DiDonato, 2013; Garrison, 2022).

While, CBI has the potential to promote cognitive presence and metacognition in online CoI because students can reach higher levels of cognitive presence that require tasks situated in

CBI (Sadaf et al., 2021), there is a need for more research to examine self-regulation and co-regulation for the problem-solving process (DiDonato, 2013; Koehler et al., 2022; Morueta et al., 2016). CBI instruction includes problem-solving process when students are required to find the solution and justify it while problem-solving process itself without CBI not necessarily includes cases. It can include only the task or the problem that students are usually asked to solve. In addition, Kills and Yildirim (2018) suggested a need for more research on self and co-regulation so as to comprehend their position, role and interaction with the other CoI constructs. To answer this call for further investigation, the purpose of this study is to explore students' perceived metacognition in relation to three online presences—teaching, social, cognitive—in the CoI within an online CBI course.

Literature Review

Metacognition

Studies have started extensively examining metacognitive processes in collaborative learning contexts (Kilis & Yildirim, 2018; Koehler et al., 2020; Koehler et al., 2022) and, specifically, recognizing individual and social regulatory processes. Metacognition is defined as the central part of any learning process to monitor and control cognition in terms of interaction between individuals and others (Akyol, 2013; Garrison & Akyol, 2015). Metacognitive processes include setting goals and monitoring and controlling progress towards goals (Akyol, 2013; DiDonato, 2013). Metacognition has become an important part of the collaborative inquiry process in order to monitor and manage the learning process for both personal and collaborative experiences. However, studies also reported that a truly collaborative environment requires more engaged approaches to help learners construct new meaning and share understanding with others (Garrison & Akyol, 2015).

The CoI framework can help understand the complex nature of truly collaborative dynamics as the framework theoretically describes the complexities and conduct of learning collaboratively (Garrison, 2017). The CoI framework encourages students to be self-reflective in building metacognitive development in collaborative learning. Moreover, following Garrison (2022), we support the statement that metacognition within the CoI consists of two components—monitoring (awareness) of the inquiry process and managing (regulation strategies) (Garrison, 2022) because the CoI requires students to collaborate for critical, creative, and innovative thinking. In this sense, metacognition can be seen as a medium between one's internal knowledge and collaborative activities. Further, managing collaborative learning requires both individual (personal dimension) and social (shared dimension) responsibilities that lead to an understanding of self-regulated and co-regulated learning (DiDonato, 2013; Garrison, 2022). Self-regulation in the CoI is accompanied by co-regulation as a group increases awareness of the learning process and takes responsibility to manage collaborative inquiry (Garrison & Akyol, 2015). According to Garrison and Akyol (2015), self-regulation of cognition reflects metacognitive monitoring and managing strategies and skills when the individual is engaged in the personal reflective learning process. On the other hand, "co-regulation of the cognition dimension reflects metacognitive monitoring and managing strategies and skills when engaged in a collaborative learning process as a member of a purposeful and coherent group of learners" (Akyol, 2015, p. 68).

Case-Based Instruction

The CoI provides the framework to understand the dynamics of metacognitive processes in collaborative inquiry learning environments where self-regulation and co-regulation are two interdependent dimensions. The difference between the two dimensions reflects the transition from an individual ("I am aware of my effort") to a shared process ("I challenge others' perspectives") (Garrison, 2017). One instructional strategy that allows students to actively monitor and manage metacognitive processes in collaborative learning is case-based instruction (Koehler et al., 2022). Case-based instruction (CBI) has been one of the most effective instructional strategies to ill-structured problem-solving skills because it provides rich contexts for farming problems and facilitates experience-based knowledge construction (Choi & Lee, 2009). The CBI as an effective strategy helps develop a sense of social responsibility, understand the contextuality and engage students in critical thinking and analytical reflection (Choi & Lee, 2009). The CBI designed within the CoI framework sets favorable conditions for collaborative thinking and learning. CBI involves students' engagement with professional problems and includes (1) narratives covering real-world situations for individual knowledge construction (self-regulation) and (2) collaborative discussions offering students to work together to solve the problem (co-regulation) (Ertmer & Koehler, 2014).

The CBI as an instructional strategy helps facilitate students' critical thinking and cognitive presence (Morueta et al., 2016; Richardson & Ice, 2010; Sadaf & Olesova, 2017). When instructors implement authentic cases into their courses, they provide students with an opportunity to work with complex real-life problems faced by professionals. Students engage in discussions of cases with their peers and use multiple perspectives when they analyze authentic problems (Stepich et al., 2001). When students respond to the real-life problems, their level of cognitive presence is usually at the high level of resolution because they need to find and justify why the solution can help solve the problem (Richardson & Ice, 2010; Richardson et al., 2012). CBI as an inquiry approach provides students with the conditions for the transition from individual knowledge construction to collaborative learning because they can interact with each other, support each other's participation, build and reshape new knowledge, facilitate collaborative knowledge construction, and support the thinking process (Koehler et al., 2022). The inquiry within CBI offers students an opportunity to explore and discover new information, and take responsibility and control of the learning transaction. The CBI offers a medium for students to monitor their understanding when completing the learning task. As a result, students are able to control their cognitive process, and the more accurate their monitoring is, the more able they are to regulate the learning process (Koehler et al., 2020).

Social Presence, Cognitive Presence, and Teaching Presence

CBI as an instructional strategy to facilitate collaborative learning can create comfortable conditions for social presence due to interactions among students (Akyol, 2009). When communication context is designed through learning activities, it can impact students' perceptions of social presence. The following categories of social presence are identified within the online CoI: affective or emotional expression, open communication, and group cohesion (Garrison & Arbaugh, 2007). Social presence as one of the essential elements of the CoI framework can enhance students' cognitive processes through social interaction. Moreover, social presence can predict students perceived cognitive presence; it also can promote cognitive presence by sustaining and supporting creative thinking in a community of learners (Akyol &

Garrison, 2019). The CBI provides dynamic development of cognitive processes because students work on solving real-world problems; they need to interact with each other.

Another essential element within the CoI is teaching presence that helps establish and maintain an effective social and cognitive presences (Garrison et al., 2010b). In addition, teaching presence contributes to the creation of an online community of learners to provide opportunities for social interactions. According to Garrison and Akyol (2015, p. 67), teaching presence can help "understand metacognitive development by encouraging students to take personal responsibility for their learning (self-regulation) through facilitating discourse and resolving misunderstandings collaboratively (co-regulation)." It seems that an online instructor could be the only one who is responsible for designing, planning, facilitating, and teaching deep thinking and meaningful learning outcomes.

To help students develop cognitive and social presence, teaching presence can be provided by an online facilitator or students themselves (Killis & Yildrim, 2018). Therefore, CBI as an effective instructional strategy has the potential to help students create a teaching presence themselves when they are engaged in social interactions while solving case problems. However, not any CBI can provide students with conditions for meaningful learning outcomes. Sometimes, students find CBI challenging because they experience negative attitudes or personal conflicts with others or they do not find relevance in CBI, which results in a lack of engagement (Koehler et al., 2020). While the strength of the CBI instruction is to guide students through all the phases of cognitive presence as a process from exploring the case up to solving the case, some students still may find it difficult to achieve higher phases of cognitive presence (i.e., solving the case) (Koehler et al., 2020) because the problem-solving tasks require self-organization and self-management skills. Not all students are able to organize and manage their own learning goals for active participation, select time to follow up with others, contribute meaningfully to CBI, decide what to read or pay attention to, and adjust learning strategies based on others' comments (Koehler et al., 2020). Therefore, it is important to understand how students can monitor and manage individual and collaborative cognitive processes to navigate learning in a shared environment within the CBI context.

Purpose of Study

Although metacognition is an important intellectual skill that plays a critical role in achieving deep and meaningful learning experiences, research on how metacognition (self-regulation and co-regulation) is manifested in students' ability to monitor and manage learning within the CBI context in the online CoI environment is limited. It is not clear how deep thinking and learning can be designed in shared collaborative contexts through discourse and students' ability to monitor and manage the collaborative inquiry process. For example, DiDonato (2013) examined how middle-school students used collaborative authentic semi-structured tasks to develop self-regulated learning. The researcher found that co-regulated interactions can contribute to individual students' self-regulation when they were given a complex semi-structured task. DiDonato (2013) suggested that further research is needed to examine and support co-regulatory processes for problem-solving processes. Similarly, in an advanced CBI course, Koelher et al. (2020) explored individual students' regulation experiences. Researchers found that students did not have effective regulation strategies to deal with the complexity of shared ownership. Researchers suggested that opportunities should be designed to help students individually and socially regulate their learning. Koelher et al. (2020) noted that further research is still needed to determine how students can regulate learning in a shared inquiry environment.

Another study by Koehler et al. (2022) explored and provided insight into how students purposefully participated within the CBI context to support group (co-regulation) and individual (self-regulation) problem-solving process. Researchers found that students' awareness (self-regulation) played an important role in their abilities to have stronger problem-solving strategies. Koehler et al. (2022) suggested that more research is needed to examine how students regulate their understanding of complex problems and how they develop strategies to overcome challenges of the problem-solving process.

Although DiDonato (2013) and Koehler et al. (2020) studies shed some light on students' self- and co-regulated processes during collaborated inquiry-based learning environments, they did not use a theoretical lens specifically focused on exploring students' metacognition and its relationship with online presences within an online CoI. The use of a well-established CoI framework that emphasizes both the personal and shared learning experience to support and sustain metacognition in a collaborative-constructivist learning environment might provide more insight and strengthen the results of the previous studies. Therefore, the purpose of this study is to explore the students' perceived metacognition in relation to an online presence with the CoI in an online CBI course. The following questions will guide this study:

1. What are student perceptions of online presences (teaching, social, and cognitive) and metacognition (self- and co-regulation) in online CBI courses?
2. What are the relationships between students' perceived metacognition (self- and co-regulation) and the three presences in online CBI courses?
3. Which of the three presences reveals the strongest association with metacognition in online CBI courses?

Theoretical Framework

Garrison et al.'s (2000) CoI was used as the theoretical framework to understand how metacognition is manifested in a shared learning environment. The CoI framework provides a model of cognition that operationalizes inquiry with the prospective to understand metacognition in an online learning environment (Akyol, 2013). The CoI framework was used as a guide to examine how students deal with multiple opportunities to be self-reflective and communicative to support and sustain metacognition in a collaborative-constructivist learning environment (Garrison & Akyol, 2015). The commonality between metacognition and the CoI is the interplay between internal knowledge construction and collaborative learning activities. The CoI framework was used because it emphasizes both the personal (reflective) and shared (collaborative) worlds of a learning experience, which is consistent with metacognition in a shared collaborative environment and the integration of the personal and shared view of metacognition (Garrison et al., 2010a).

Methods

Participants

A purposeful sample of 47 graduate students from a public university located in the southeast of the U.S. was selected to participate in this study. The sample was majority female (76.6%, n = 36; male: 17.0%, n = 8; unknown: 6.4%, n = 3) and approximately half (57.4%, n = 27) of them were more than 36 years old. The majority (76.6%, n = 36) of the participants have taken more than four online courses and most (83.0%, n = 39) of them rated themselves as being very comfortable with participating in online courses. Table 1 provides detailed information about the study participants. The sample was included in the study because students were

enrolled in the online graduate course designed based on a CBI to learn instructional design (ID) skills.

Table 1
Demographic Information of Participants (n = 47)

	N	%		N	%
Gender			Age		
Male	8	17.0	21–25	5	10.6
Female	36	76.6	26–30	11	23.4
Prefer not to answer	3	6.4	31–35	4	8.5
Student status			36–40	15	31.9
Graduate certificate	4	8.5	More than 40	12	26.5
Master's	43	91.5	Comfort level with online discussions		
Number of online courses taken			Not at all	2	4.3
1	2	4.3	A little	1	2.1
2	4	8.5	Fairly	5	10.6
3	5	10.6	Very	39	83.0
4 or more	36	76.6			

Context of the Study

The study was conducted in an "Advanced Instructional Design" sixteen-week asynchronous online course required for master's and graduate certificate students in the Learning, Design, and Technology program. Students engaged in authentic design activities via participation in an online community of inquiry and participated in two instructor-facilitated case discussions at the beginning of the semester, followed by participation in four student-led case discussions. For each case, students participated in two-week long discussions. First week, students were required to find the problem within the case and then second week provide the solution to those problems. Students were required to co-analyze instructional design problems, work with diverse teams and individuals, develop solutions to real instructional design problems via cases, and give and receive constructive feedback from peers and the instructor.

Prior to participation in the case discussions, students completed individual case analyses in which they reflected on and responded to a number of specific prompts that required students to identify stakeholders, ID challenges, and potential solutions to the problems presented in the case**.** The prompts were designed for students to give each of the issues presented in the cases careful consideration before participating in the class discussions. Then, students participated in weekly discussions and proposed/developed relevant solutions to the issues presented in a case. Finally, at the middle and at the end of the course, students reflected on their development of expertise in solving cases. These activities offered students the opportunity to develop instructional design skills based on real-world cases. Course activities and assignments were designed to help students develop the knowledge, strategies, and attitudes needed to become effective instructional designers. Learning experiences revolve around two major activities: (1) the analysis and synthesis of, and reflection on, instructional design case studies and (2) ongoing reflection on the development of students' instructional design expertise through written case analysis, course discussions, and reflections.

Data Collection

Data were collected from two consecutive years of the same online course taught during the Spring 2021 and 2022 semesters. As the final course reflection assignment, students were required to either write a reflection paper or participate in the online survey administered through Qualtrics. Directions for completing both assignments were provided in the last module of the Canvas online course. The purpose of the study was explained as well as the time commitment required for participation. All 47 students chose to complete the online survey for a 100% response rate. The informed consent statement approved by the Institutional Review Board (IRB) was posted on the web as the opening page of the online survey. All students agreed to participate in the study and signed the consent form by clicking on a button "I agree to complete this survey."

The CoI Survey and the metacognition questionnaire were used to collect data. The CoI survey was developed by Arbaugh et al. (2008) to measure students' perception of teaching presence (TP), social presence (SP), and cognitive presence (CP). The survey consists of 34 five-point, Likert-type items (TP: 13 items, SP: 12 items, CP: 9 items) with the response categories ordered from "1 = strongly disagree" to "5 = strongly agree". The instrument was validated by conducting exploratory factor analysis (EFA) by Garrison and colleagues in 2004. The final three-factor structure of the 34 items was with no cross-loading (Garrison et al., 2004). The 34-item structure explained 53.6% of the variance in the pattern of relationship among the items (e.g., teaching presence 38.47%, cognitive presence 9.01% and social presence 6.12%). The CoI instrument has been also tested and validated with a multi-institutional data set (Arbaugh, 2007; Swan et al., 2008). The internal consistency reliability of the 34 items was high with a Cronbach's Alpha of .91 for social presence, .95 for cognitive presence, and .94 for teaching presence (Swan et al., 2008). Shea and Bidjerano (2009) conducted confirmatory factor analysis (CFA) and found that the hypothesized model of the 34-item structure was verified as an excellent fit for the data ($\chi2 = 11,155.16$ (df = 623), pb.00, NFI = .95, CFI = .95, GFI = .95, RMSEA = .08).

Students' perceptions of metacognition were measured using the metacognition questionnaire developed by Garrison and Akyol (2015), which includes 26 five-point, Likert-type items in two dimensions: self-regulation and co-regulation. Each item employs a five-point Likert-type scale, with 1 = strongly disagree and 5 = strongly agree. Garrison and Akyol (2015) conducted an EFA of the instrument. The results confirmed the theoretical structure of the metacognition construct in terms of extracting two factors that are identified as self- and co-regulation of cognition. The authors also conducted an EFA to explore the monitoring and managing sub-elements of self- and co-regulation. The items did not load as hypothesized that there was a correlation among the factors (individual monitoring and managing; group monitoring and managing). As a result, it was difficult to interpret the monitoring and managing sub-elements of self- and co-regulation (Garrison & Akyol, 2015).

In our study, the reliability of the CoI survey and metacognition questionnaire was found to be generally satisfactory, with its Cronbach's alpha value of .96 and .93, respectively. When each of the sub-factors being considered individually, for the CoI survey, the alpha coefficients for cognitive, social, and teaching presences were .88, .91, and .97, respectively. The sub-factor reliability was .92 and .91 for self-regulation and co-regulation.

Simple demographic information was also collected such as gender, age, prior experience with online courses, and the program to which a student belongs. Students were asked to respond

to three sets of survey questions: with a reflection on their CoI, self-regulation, and co-regulation.

Data Analysis

The survey data were analyzed through descriptive statistics using means and standard deviations. In addition, correlation analysis was conducted to explore the relationships between the three presences of CoI (Cognitive, Teaching, and Social) and metacognition (self-regulation and co-regulation) in the CBI course. A set of assumptions required to use a Pearson correlation was examined including normality, linearity, and no presence of outliers. Given that the Shapiro-Wilk test for normality revealed significance for some of the variables, which suggested a violation of the assumption of normality, the Spearman correlation was used which does not require normality or linearity of data.

Results

RQ1: Student perceptions of online presence and metacognition

Results showed, in general, students' perceived cognitive presence was the highest ($M = 4.509$, $SD = .428$) among the three types of online presences and two dimensions of metacognition, followed by self-regulation ($M = 4.417$, $SD = .444$) (see Table 2). Additionally, students had the lowest rating on co-regulation ($M = 4.160$, $SD = .551$). It is also interesting to note that the level of perceived cognitive presence was less variable than others with a standard deviation of .428, meaning that students generally perceived their cognitive presence higher than other types of online presences and metacognition and the tendency was rather consistent across students. By contrast, the level of teaching presence was found to be the most variable among students, having a standard deviation of .718. This suggests that students' perceptions tend to differ in teaching presence.

Table 2
Students' Perceived Cognitive Presence, Social Presence, Teaching Presence, and Metacognition (n = 47)

	Mean	SD
Cognitive Presence	4.509	0.428
Social Presence	4.265	0.599
Teaching Presence	4.398	0.718
Metacognition (Self-Regulation)	4.417	0.444
Metacognition (Co-Regulation)	4.160	0.551

RQ2: Relationship between students' perceived metacognition and the three presences

Relationships between cognitive presence, social presence, teaching presence, self-regulation, and co-regulation were explored based on the Spearman correlation (see Table 3). Some pairs of the five variables showed statistically significant relationships, having a correlation value of .390 ~ .653. One interesting finding is that co-regulation showed stronger relationships with the three types of online presences than self-regulation did. Specifically, co-regulation had a statistically significant correlation value of .653 with social presence while self-regulation revealed a significant correlation value of .397. A similar pattern was also observed for cognitive presence and teaching presence but the degree of association was slightly weaker

for these two than for social presence. Also, the correlation between two dimensions of metacognition (e.g., self-regulation and co-regulation) was found to be significantly high with the correlation of .561. This implies that students with high self-regulation tend to have high co-regulation, and vice-versa.

Table 3
Pearson Correlation Coefficients Between Perceived Cognitive Presence, Social Presence, Teaching Presence, and Metacognition (n = 17)

	Cognitive Presence	Social Presence	Teaching Presence	Metacognition (self)
Social Presence	0.528**			
Teaching Presence	0.546**	0.258		
Metacognition (self-regulation)	0.390*	0.397**	0.096	
Metacognition (co-regulation)	0.514**	0.653**	0.228	0.561**

Note. * indicates *p* <.01. ** indicates *p* < .001.

RQ 3: Strength of association between three presences and metacognition

To answer the last research question, correlations between the three presences and metacognition were examined. In general, social presence demonstrated the strongest association with both self-regulation and co-regulation, followed by cognitive presence (see Table 3). By contrast, teaching presence revealed no statistically significant relationship with metacognition with its value of .096 and .228 for self-regulation and co-regulation, respectively. These results suggest that students with higher perceived social presence tend to have higher metacognition while those with higher perceived teaching presence are relatively less likely (or unlikely) to have higher metacognition.

Discussion

This study sought to gain insight into students' perceived metacognition within the online CoI and whether there is a relationship between students' perceived metacognition (self-regulation and co-regulation) and the three CoI presences (cognitive, social, teaching) in an online CBI course.

RQ1: Student perceptions of online presences and metacognition

Results revealed that students generally perceived their cognitive presence as higher than social or teaching presence with a consistent tendency across students. This shows that when students participate in an online course using CBI, they tend to perceive high cognitive presence through collaborative experiences that are designed to encourage a deeper understanding of the issues presented in case problems. This may be due to students' comfort level with online CBI since the students were enrolled in the graduate level course and most of them were very comfortable with participating in online courses. These results corroborate previous studies addressing the importance of cognitive presence for creating an effective CBI in online graduate level courses (Sadaf & Olesova, 2017; Sadaf et al., 2021). For example, Sadaf et al. (2021) noted that when students participate in CBI, they tend to identify high levels of cognitive presence in terms of exploring the problems and creating potential solutions to the issues presented in the case. Similarly, Ertmer and Koehler (2014) noted that case-based discussions can stimulate students' critical thinking by engaging them in constructive discourse related to both the case and content of the course. Scholars have concluded that CBI strategies that require students to

respond to a case to create a solution are beneficial in generating high levels of cognitive presence (Sadaf & Olesova, 2017; Sadaf et al., 2021).

For metacognition, students' perceptions of self-regulation were higher than their perceptions of co-regulation with a consistent tendency across students. This is reinforced in a study that concluded self-regulated learning skills play an important role in the CoI framework and self-regulated students demonstrate a stronger sense of the CoI elements (Cho et al., 2017). Similarly, Garrison and Akyol (2015) also found that individuals' perception of self-regulation was higher than their perceptions of co-regulation. This suggests when students participate in an online CBI course, their perception of self-regulation is higher than their perceptions of co-regulation. However, a complex collaborative environment also requires strong co-regulation skills in understanding peers and instructors. Similarly, Koehler et al. (2020) also found that while students value instructor feedback within the CBI context, some still did not fully consider their contribution or their peers' roles in sharing metacognitive processes (co-regulation). When students embrace co-regulation, their perception of shared ownership is not strong (Koehler et al., 2020). For example, Koehler et al. (2020) mentioned that while some students provide strong feedback, their peers are reluctant to trust their ideas, or they valued ideas only from peers whom they are familiar with.

RQ2: Relationship between students' perceived metacognition and the three presences

In terms of metacognition, it is important to understand cognitive ability consisting of both self-regulation and co-regulation skills in the CoI. In this regard, our results revealed that students with high perceived self-regulation tend to have high perceived co-regulation and vice-versa. This suggests that students participating in an online CBI course perceive they have the knowledge and skills to monitor and regulate cognitive processes of self and others due to the collaborative nature of the course. This may be due to the CBI strategies that required students to co-analyze instructional design problems, work with diverse teams and individuals, develop solutions to real instructional design problems via cases, and give and receive constructive feedback from peers and the instructor. Through these strategies, students contributed to case-based inquiry to develop self and co-regulatory metacognition processes (Garrison & Akyol, 2015).

In addition, students' co-regulation is strongly related to an online presence, except teaching presence. This suggests that when students participate in an online CBI course, they perceive they have high self-regulation, which leads to high co-regulation. Therefore, higher self-regulated students are likely to perceive higher co-regulated learning that leads to a sense of higher social presence, and cognitive presence in an online course using a CBI course. CBI provides learners with the conditions for the transition from individual knowledge construction to collaborative learning because they can interact with each other, support each other's participation, build and reshape new knowledge, facilitate collaborative knowledge construction, and support the thinking process (Koehler et al., 2022). Akyol and Garrison (2011) emphasized the value of the CoI framework and the comprehensiveness of its presences by stating that "each presence directly or indirectly contributes to the development of metacognition" (p. 88).

RQ 3: Strength of association between three presences and metacognition

Results revealed that among three presences, social presence demonstrated the strongest association with metacognition in the online CBI course. This suggests that although the three presences are essential for metacognition in a learning community, in a CBI course, students

with higher perceived social presence tend to have higher metacognition. It is not surprising because, within the online CoI, social presence creates the affective environment for the emergence of social metacognition (Akyol, 2013). Students need to understand each other and what others say without guessing what was said. That's why social interactions create metacognition in a shared environment among members. Students see themselves purposefully within the group with a common purpose (Akyol, 2013). Through social presence, students' own beliefs become available to others creating shared agreement between members (Garrison, 2017). In the CBI course, students were required to co-analyze instructional design problems, work with diverse teams and individuals, develop solutions to real instructional design problems via cases, and give and receive constructive feedback from peers and the instructor. According to Garrison and Akyol (2015), social presence creates the motivational and academic environment essential for metacognition development in a CoI.

On the other hand, results showed that students with higher perceived teaching presence are relatively less likely (or unlikely) to have higher metacognition in a CBI course because the level of teaching presence was found to be the most variable among students meaning students were different in teaching presence. This finding can relate to Koehler et al. (2020) findings that within the CBI context, some students still rely on instructor-set course requirements to guide their own solutions. They perceived the instructor as the most significant in the solution process and they wanted to get specific grade outcomes. These students used to follow well-structured problems instead of an ill-structured process that the CBI context is focused on. Usually, these students trust only instructor feedback and they do not rely on their peers' comments which prevents them from developing co-regulation skills. On the contrary, other students, who might be more advanced in their professional careers or have richer shared participation experience, took responsibility for self-regulating and co-regulating their own learning while receiving support from the community instead of just relying on the teaching presence. This shows that in an online CBI, advanced students' perceptions of social presence are more important for their metacognition development to be successful in collaborative inquiry learning compared to their perception of teaching presence.

The finding of varied teaching presence in our study is reinforced by previous studies of CBI that an advanced graduate course may require instructors to plan and implement regulation strategies by encouraging, supporting, and challenging advanced students without being too directive or authoritative or where instructor attention and facilitation can be minimal or absent (Ertmer & Koehler, 2014). However, instructors still need to support other students' engagement and progression in their case learning process and train them so that they can gain the full benefit of the CBI (Koelher et al., 2020). Therefore, teaching presence can vary within the CBI due to student differences in age, online learning experience, or comfort with online CBI. Students may or may not need more instructional encouragement or support to become metacognitively aware and active in terms of monitoring and managing the inquiry process depending on their experiences (Garrison & Akyol, 2015).

Limitations and Future Research

This study has some limitations that may lead to future research efforts. First, this study is limited in the generalizability of findings due to the small sample size and participants representing only one graduate level program and university. Future studies can use a large sample size with data collected across programs or institutions to further refine the results and implications of this study. Second, this study did not attempt to look at the implementation of

specific case-based instructional strategies that supported metacognition and presences in an online CoI. Investigating student perceptions of metacognition as explained by the three elements of teaching presence—instructional design and course organization, direct instruction, and facilitation—in an online case-based course could be included in future research. Finally, more research examining the relationship between students' self-regulation and co-regulation and their perceptions of CoI within a different context or using a different instructional strategy other than CBI would be a promising direction for future studies.

Conclusions and Implications

This study makes a significant contribution in terms of a relationship between students' perceived metacognition (self-regulation and co-regulation) and the CoI presences (cognitive, social, teaching) in an online CBI course. First, it provides evidence that students have high perceived cognitive presence and self-regulation when they participate in an online CBI course confirming findings from previous studies (Sadaf & Olesova, 2017; Sadaf et al., 2021). In this regard, cognitive presence indicators and self-regulation skills may serve as valuable references for educators when planning CBI in their online courses to support metacognitive skills. Second, although metacognition showed a significant relationship with two presences (cognitive and social), co-regulation revealed a stronger significant relationship than self-regulation. With students' co-regulation providing control over learning, time, and process gaining more importance, especially with online collaborative learning, understanding co-regulation in addition to self-regulation comprehensively promises better results in creating an online collaborative community of inquiry in online CBI. Co-regulation is defined as a dimension that reflects metacognitive monitoring and managing strategies and skills when students engaged in a collaborative learning process as a member of a purposeful and coherent group of learners (Garrison, 2022). For example, within the CBI, students can co-regulate by providing explanations to peers and listening to explanations instead of just pointing out the errors in their work. Third, students with high perceived social presence tend to have higher metacognition for both self-regulation and co-regulation. This emphasizes the importance of collaboration in the CBI course to solve real-world problems as an opportunity for students to become aware of and engaged with others' metacognitive thoughts and activities in addition to their personal reflections. Finally, despite the growing interest in the CoI framework that can provide guidance for designers of online learning, there still seems to be a need in how to use them to inform the design of online collaborative learning experiences that supports students' metacognition. Having a clear understanding of self-regulation and co-regulation and their role in the collaborative inquiry will lead to developing strategies that can promote metacognitive awareness and skills in online CBI and other inquiry-based contexts.

Declarations
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References

Akyol, Z. (2013). Metacognitive development within the Community of Inquiry. In Z. Akyol & D. R. Garrison (Eds.), *Educational communities of inquiry: Theoretical framework, research and practice* (pp. 30–44). IGI Global.

Akyol, Z., & Garrison, D. R. (2011). Assessing metacognition in an online community of inquiry. *The Internet and Higher Education, 14*(3), 183–190. https://doi.org/10.1016/j.iheduc.2011.01.005

Akyol, Z., & Garrison, D. R. (2019). The development of a Community of Inquiry over time in an online course: Understanding the progression and integration of social, cognitive and teaching Presence. *Online Learning, 12,* 3–22. https://doi.org/10.24059/olj.v12i3-4.1680

Anderson, T., Rourke, L., Garrison, D. R., & Archer, W. (2001). Assessing teacher presence in a computer conferencing context. *Journal of Asynchronous Learning Networks, 5*(2), 1–17.

Arbaugh, J. B. (2007). An empirical verification of the community of inquiry frame-work. *Journal of Asynchronous Learning Networks, 11*(1), 73–85.

Arbaugh, J. B., Cleveland-Innes, M., Diaz, S. R., Garrison, D. R., Ice, P., Richardson, J. C., et al. (2008). Developing a community of inquiry instrument: Testing a measure of the community of inquiry framework using a multi-institutional sample. *The Internet and Higher Education, 11*(3), 133–136. https://doi.org/10.1016/j.iheduc.2008.06.003

Cho, M. H., Kim, Y., & Choi, D. (2017). The effect of self-regulated learning on college students' perceptions of community of inquiry and affective outcomes in online learning. *The Internet and Higher Education*, *34*, 10–17.

Choi, I., & Lee, K. (2009). Designing and implementing a case-based learning environment for enhancing ill-structured problem solving: Classroom management problems for prospective teachers. *Educational Technology and Research Development, 57*(1), 99–129. https://doi.org/10.1007/s11423-008-9089-2

DiDonato, N. (2013). Effective self- and co-regulation in collaborative learning groups: An analysis of how students regulate problem solving of authentic interdisciplinary tasks. *Instructional Science*, *41*(1), 25–47. https://doi.org/10.1007/s11251-012-9206-9

Ertmer, P. A., & Koehler, A. A. (2014). Online case-based discussions: Examining coverage of the afforded problem space. *Educational Technology Research and Development, 62*(5), 617–636.

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

Garrison, D. R. (2022). Shared metacognition in a Community of Inquiry. *Online Learning, 26*(1), 6–18. https://doi.org/10.24059/olj.v26i1.3023

Garrison, D. R., & Akyol, Z. (2015). Toward the development of a metacognition construct for the community of inquiry framework. *Internet and Higher Education*, *24*, 66–71. https://doi.org/10.1016/j.iheduc.2014.10.001

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

Garrison, D. R., Anderson, T., & Archer, W. (2001). Critical thinking, cognitive presence, and computer conferencing in distance education. *American Journal of Distance Education, 15*(1), 7–23.

Garrison, D. R., Anderson, T., & Archer, W. (2010a). The first decade of the community of inquiry framework: A retrospective. *The Internet and Higher Education, 13*(1–2), 5–9. https://doi.org/10.1016/j.iheduc.2009.10.003

Garrison, D. R., Anderson, T., & Archer, W. (2000). Critical inquiry in a text-based environment: Computer conferencing in higher education. *The Internet and Higher Education, 2*(2–3), 87–105.

Garrison, D. R., Cleveland-Innes, M., & Fung, T. S. (2004). Student role adjustment in on-line communities of inquiry: Model and instrument validation. *Journal of Asynchronous Learning Networks, 8*(2), 61–74.

Garrison, D. R., Cleveland-Innes, M., & Fung, T. S. (2010b). Exploring causal relationships among teaching, cognitive and social presence: Student perceptions of the community of inquiry framework. *The Internet and Higher Education*, 13(1–2), 31–36. https://doi.org/10.1016/j.iheduc.2009.10.002

Kilis, S., & Yıldırım, Z. (2018). Investigation of community of inquiry framework in regard to self-regulation, metacognition and motivation. *Computers & Education, 126*, 53–64. https://doi.org/10.1016/j.compedu.2018.06.032

Koehler, A. A., Cheng, Z., Fiock, H., Wang, H., Janakiraman, S., & Chartier, K. (2022). Examining students' use of online case-based discussions to support problem solving: Considering individual and collaborative experiences. *Computers & Education, 179*, 104407. https://doi.org/10.1016/j.compedu.2021.104407

Koehler, A. A., Fiock, H., Janakiraman, S., Cheng, Z., & Wang, H. (2020). Asynchronous online discussions during case-based learning: A problem-solving process. *Online Learning*, *24*(4), 64–92.

Morueta, R. T., López, P. M., Gómez, Á. H., & Harris, V. W. (2016). Exploring social and cognitive presences in communities of inquiry to perform higher cognitive tasks. *The Internet and Higher Education, 31*, 122–131.

Richardson, J. C., & Ice, P. (2010). Investigating students' level of critical thinking across instructional strategies in online discussions. *The Internet and Higher Education, 13* (1–2), 52–59. https://doi.org/10.1016/j.iheduc.2009.10.009

Richardson, J. C., Sadaf, A., & Ertmer, P. A. (2012). Relationship between types of question prompts and critical thinking in online discussions. In Z. Akyol & D. R. Garrison (Eds.), *Educational communities of inquiry: Theoretical framework, research and practice* (pp. 197–222). IGI Global.

Sadaf, A., Kim, S. Y., & Wang, Y. (2021). A comparison of cognitive presence, learning, satisfaction, and academic performance in case-based and non-case-based online discussions. *American Journal of Distance Education,* 1–14. https://doi.org/10.1080/08923647.2021.1888667

Sadaf, A., & Olesova, L. (2017). Enhancing cognitive presence in online case discussions with questions based on the practical inquiry model. *American Journal of Distance Education*. *31*(1), 56–69.

Shea, P., & Bidjerano, T. (2009). Community of inquiry as a theoretical framework to foster "epistemic engagement" and "cognitive presence" in online education. *Computers & Education, 52*(3), 543–553.

Stepich, D. A., Ertmer, P.A., & Lane, M.M. (2001). Problem solving in a case-based course: Strategies for facilitating coached expertise. *Educational Technology Research & Development, 49*(3), 53–67. https://doi.org/10.1007/BF02504915

Swan, K., Richardson, J., Ice, P., Garrison, D.R., Cleveland-Innes, M., & Arbaugh, J. B. (2008). Validating a measurement tool of presence in online communities of inquiry. *E-Mentor, 2*(24), 1–12.

The Use of Community of Inquiry Framework-Informed Facebook Discussion Activities on Student Speaking Performances in a Blended EFL Class

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Abstract
Students' extensive use of Facebook in their daily lives has led researchers to investigate the affordances of Facebook for educational purposes. To further the research into the use of Facebook to improve language teaching, we conducted a convergent parallel mixed-methods study to examine the use of Community of Inquiry-informed Facebook discussion activities on the speaking performances of undergraduate students in a blended EFL speaking class in Bangladesh. A Facebook group was maintained for both the treatment and control conditions; however, the discussion activities were required only by the treatment condition. We found a statistically significant difference between the initial and post-test speaking scores for the treatment and control conditions. While no difference was observed in post-test scores between the two conditions, students' and the instructor's comments on the Facebook group and student interview data revealed that Facebook was helpful for both conditions in improving their performances, but in different ways.

Keywords: language teaching, foreign language speaking, technology-enhanced language teaching, Facebook, Community of Inquiry

Social media is widely used by young people in their daily lives (Auxier & Anderson, 2021; Chaffey, 2022) and has been used for educational purposes (Almuwayshir, 2021; Awada, 2016; Li et al., 2021). Facebook, the most widely used social media platform (Social Media–Statistics & Facts, 2021), has been shown to have the potential to improve students' learning (e.g., Nazir & Brouwer, 2019; Ozturk, 2015). It has also been used in English language classes where students improved their language skills using Facebook as a platform (Ahmed, 2016; Ping & Maniam, 2015).

Social media is part of an ever-changing online environment, and their use for education will be more valuable if a framework guides activities to make them meaningful (Conole et al., 2011). The Community of Inquiry (CoI) framework (Garrison et al., 2000) is widely used by researchers and instructors to understand the online learning environment (Garrison et al., 2010), yet only a few studies have investigated the effectiveness of using the CoI framework to guide the use of Facebook group: instructional media design (Kazanis et al., 2018), community service (Keles, 2018), information studies (Nazir & Brouwer, 2019), and education philosophy (Ozturk, 2015). The findings of these studies support the use of the CoI framework on Facebook platforms for these areas of studies to facilitate learning.

Although several intervention studies have been conducted on the use of Facebook for English language learning (Ahmed, 2016; Ping & Maniam, 2015; Shukor & Noordin, 2014), no studies have investigated the effectiveness of the CoI framework in Facebook groups to improve English speaking performances. Ultimately the competitive advantage of English proficiency in the job market (Doan and Hamid, 2019; Khamkhien, 2010; Nair et al., 2012) requires further examination of the design and implementation of social media, including design frameworks such as the CoI, for the English proficiency development process. Therefore, this study will provide insights into the use of CoI-informed Facebook discussion activities on improving students' speaking performances in an English as a Foreign Language (EFL) speaking class.

Background

Importance of English-Speaking Skills and Technology Used to Teach Speaking Skills

To enhance language proficiency, speaking is one of the four macro skills along with reading, writing, and listening, that is included in language curricula (Khamkhien, 2010). Fluency in spoken English is highly important for academic and professional success (Khamkhien, 2010). Moreover, learning English is crucial for undergraduate students in some countries as they are likely to apply for jobs that require English proficiency after completing their degrees. For instance, sufficient English proficiency is often a requirement to apply for jobs in the Australian job market for Bangladeshi graduates (Roshid & Chowdhury, 2013), the Vietnamese job market (Doan & Hamid, 2019), the Malaysian job market (Nair et al., 2012), and Nepalese job market in engineering fields (Shrestha et al., 2020).

Beyond the traditional face-to-face classroom experiences, varying digital tools and platforms have been used to teach speaking skills over the years: video blogging (Marzuki & Nurpahmi, 2019; Rakhmanina & Kusumaningram, 2017), visual media (Baidawi, 2016), instant messaging apps (Mustafa, 2018), and social media platforms (Hurt et al., 2012). These tools have been shown to be effective in enhancing language skills in these studies.

Social Media in Education

Integrating social media into education can be beneficial in creating meaningful interaction (Hamid et al., 2015). For example, studies have shown that social media can be used as a learning tool (Mao, 2014) and for collaborative platforms (Liu, 2010). Social media can also help students establish academic connections (Aijan & Hartshorne, 2008). In addition, students have shown positive perceptions regarding using social media in education (Aydin & Ozdemir, 2019; Lim & Richardson, 2016). It can also be used to facilitate teaching and learning as an alternative learning platform (Kabilan et al., 2010; Mabuan & Ebron, 2017). Instructors have

also perceived social media positively for the purpose of education (Balcikanli, 2015; Yu, 2014). Koehler and Vilarinho-Pereira (2021) found five broad types of affordances social media offers through their analysis of literature: association (e.g., interaction and collaboration with peers and instructors), visibility (e.g., students can view the comments and number of likes), preservation (e.g., student posts can be accessed long after it is posted), searchability (e.g., searching specific content with keywords), and identity creation (e.g., through profile creation and interaction pattern).

Theories related to language learning have provided insights into how language learning can be facilitated effectively. Sociocultural theory and interaction hypothesis are two such theories. According to sociocultural theory, interaction is considered the genesis of language development (Lantolf & Thorne, 2006). Similarly, in the interaction hypothesis, interaction plays a prominent role in the second language learning process (Long, 1996). The interactive features of social media can be instrumental in facilitating language learning as these two prominent theories related to language development/learning—Sociocultural Theory (Vygotsky, 1986) and Interaction Hypothesis (Long, 1996)—consider interaction as the basis for language development (Ellis, 1999; Lantolf & Thorne, 2006).

Different social media have been used in facilitating language learning over the years: Facebook (Ahmed, 2016; Ping & Maniam, 2015), Twitter (Almuwayshir et al., 2021; Alhajaji et al., 2020), WhatsApp (Awada, 2016; Minalla, 2018), Skype (Dirjal et al., 2020; Kato et al., 2016), Instagram (Eraslan, 2019), and YouTube (Hamad et al., 2019). These studies have found significant results favoring the use of social media for language learning (see Table 1).

Table 1
Studies that Used Different Social Media and Their Findings

Social Media Used	Study	Main Findings
Facebook	Ahmed, 2016	Undergraduate students' English grammar and essay writing skills have been improved.
	Ping & Maniam, 2015	Pre-tertiary students' English writing skills have been improved.
Twitter	Almuwayshir et al., 2021	Undergraduate senior level female students' English summary writing skills have been improved.
	Alhajaji et al., 2020	Undergraduate students' English vocabulary skills have been improved.
WhatsApp	Awada, 2016	Sophomore students' critique writing skills in English have been improved.
	Minalla, 2018	First year undergraduate students' English verbal interaction skills have been improved.
Skype	Dirjal et al., 2020	Undergraduate students' English listening skills have been improved.
	Kato et al., 2016	Undergraduate students' English listening and speaking abilities have been improved.
Instagram	Eraslan, 2019	Undergraduate students' general English language skills have been improved.
YouTube	Hamad et al., 2019	Undergraduate students' English-speaking skills have been improved.

Facebook in Education

Of the 4.2 billion people worldwide to actively use social media, Facebook has the highest number of users (Social Media–Statistics & Facts, 2021). Facebook has also been shown to have the potential to be used for educational purposes (Kabilan et al., 2010; Omar et al., 2012; VanDoorn & Eklund, 2013; Wang et al., 2012) and as a meaningful online learning environment (Camus et al., 2016; Kabilan et al., 2010). On Facebook, instructors can create groups for their students (Keles, 2018; Ozturk, 2015) and use these groups for the following interactive purposes:

- Instructors and students can upload both text-based (Kazanidis et al., 2018) and multimedia content (Keles, 2018);
- Instructors and students can comment on any content posted by any member of the group and thereby participate in interactive discussion activities (Jin, 2015);
- Apart from commenting, instructors and students can also give reactions (i.e., like, love, care, haha, wow, sad, angry) in the forms of emojis in response to any post (Nazir & Brouwer, 2019).

Because of these features, researchers have also indicated the potential of social media as an alternative learning management system (Dabbagh & Kitsantas, 2012). Several intervention studies have examined the use of Facebook for English learning in higher education and reported supportive findings. For example, Ahmed (2016) found that a treatment group using the Facebook platform for developing grammar and essay-writing skills outperformed the control group in different areas of essay writing (i.e., ideas and content, organization, style, and voice). The students in the treatment group used the discussion feature of the Facebook group for three months for giving feedback on each other's essays and asking grammar and essay-related questions to their peers and teachers. Ping and Maniam (2015) observed similar results for a pre-tertiary English course using Facebook discussion activities on students' writing. The students engaged in Facebook discussion activities for three weeks where they responded to topics in writing (one topic per week) posted by the instructors. They brainstormed ideas, contributed to the topics, and read and commented on their peers' posts. However, Shukor and Noordin (2014) did not find any significant difference between the experimental group and the control group in terms of improving different aspects of argumentative writing (i.e., content, organization, vocabulary, language use, mechanics). The six-week writing activities on argumentative writing ran on Facebook for the experimental group, and the students in the control group followed a conventional face-to-face method for collaboration. However, these studies did not use a well-established framework to guide Facebook discussion activities.

A Framework to Guide Facebook Activities

Numerous frameworks have been developed to guide teaching and learning practices in an online learning environment. Design frameworks provide instructors with specific ways of achieving instructional goals (Conole et al., 2011). Since Facebook is an online learning environment, the use of Facebook for educational purposes can be made more effective by using a framework that is specific to online education. To this end, the CoI framework (Garrison et al., 2010) serves as a suitable online learning framework consisting of three interconnected components: teaching presence, cognitive presence, and social presence.

The three CoI components work coherently to construct a meaningful online learning environment. Cognitive presence is "the extent to which learners are able to construct and confirm meaning through sustained reflection and discourse in a critical community of inquiry" (Garrison et al., 2010, p. 89). Social presence is the social and emotional attachment that learners in an online community feel for each other (Swan et al., 2009). Teaching presence consists of three elements: how instructors or/and instructional designers design the learning environment, how instructors and/or students facilitate the learning activities in that environment, and how instructors and/or students provide direct instruction in that environment (Garrison et al., 2000).

Although abundant studies have used the CoI as a framework to investigate the online learning environment, only a few studies have explored the use of Facebook for educational activities through the lens of the CoI framework. These studies support the usefulness of the CoI framework for the effective integration of Facebook for education. Keles (2018), for instance, investigated the use of Facebook in a blended community services practice course for prospective teachers at the undergraduate level and found that the student and instructor interactions in the Facebook group created higher levels of teaching and social presence. Ozturk (2015), after examining six Facebook groups for a compulsory blended Education Philosophy course at the undergraduate level, found significant correlations between the three presences of the CoI framework and concluded that Facebook can be used as an online learning environment. Nazir and Brouwer (2019) concluded after studying six online courses of an information studies program that Facebook platforms can generate a strong perception of a community of inquiry for students if the course activities are appropriately designed following the CoI framework. Finally, Kazanidis et al. (2018) found that the Facebook platform generated more social presence than a traditional learning management system after implementing activities in a blended instructional media design course.

Purpose of the Study

Studies have been conducted on the perceptions of students and teachers on the use of Facebook, the influence of Facebook use on students' learning outcomes, and the effectiveness of the CoI framework in guiding discussion activities in Facebook groups (e.g., Aydin & Ozdemir, 2019; Ping and Maniam, 2015). However, to the best of our knowledge, no study has examined the use of Facebook discussion activities using the CoI framework for improving the English-speaking performances of students. Therefore, this study investigated the use of CoI-informed Facebook discussion activities on the speaking performances of students. Specifically, this study sought to answer the following questions:

RQ 1: How did the instructor and students' participation in the Facebook discussion activities reflect the CoI framework?
RQ2: What are the effects of Facebook discussion activities informed by the CoI framework on the speaking performances of students?
RQ3: What were students' experiences participating in the treatment and control Facebook groups?

Method

Research Design
The study used a convergent parallel mixed-methods design (Creswell, 2017) where quantitative and qualitative data were given equal importance, collected, and analyzed separately, and later triangulated to address research questions. A quasi-experimental design was utilized for the quantitative part. Thematic analysis was used for the qualitative part by applying inductive and deductive methods for social media interactions and student interviews respectively (Saldana, 2016). We chose this design to use the strengths of both quantitative and quantitative data, and we believed that a more comprehensive understanding of the scenario could be achieved if we used both forms of data in our analysis (Creswell, 2017).

Research Context and Participants
The setting was two blended undergraduate EFL speaking sections during the fall semester in 2019 taught by the same instructor at a Bangladeshi private university. All students in the university must take at least three English courses during their undergraduate program. The course lasted for sixteen weeks, and it was delivered primarily in an in-person format blended with a Facebook group for announcements and discussions throughout the course duration.

The university did not have a formal Learning Management System (LMS) then, and this Facebook group served as an LMS. Of these two sections, one section served as the treatment condition (n = 25, 14 male and 11 female students), and another served as the control condition (n = 28, 11 male and 17 female students). Students were from engineering, business, social science, pharmacy, and natural science departments. Of the 25 participants in the treatment group, 3 had incomplete data and were excluded from the analysis, leaving a final count of 22 (12 male and 10 female students) students in the treatment condition and 28 (11 male and 17 female students) in the control condition.

Table 2
Student Demographics in the Treatment and Control Condition

	Initial			Incomplete			Final		
	Male	Female	Total	Male	Female	Total	Male	Female	Total
Treatment Condition	14	11	25	2	1	3	12	10	22
Control Condition	11	17	28	0	0	0	11	17	28

CoI-Informed Facebook Discussion Activities
Facebook discussion activities were designed before the course following the CoI framework to generate social, cognitive, and teaching presences:

Table 3
CoI Framework Component and Description

CoI Framework Component	Description
Teaching Presence	The discussion activities were designed with the purpose of generating participation among students regarding the posted presentations. The design also included involving the instructor and students to suggest ways of improvement to make the posted presentations better (Anderson et al., 2001).
Cognitive Presence	The discussion activities prompted students to identify the strengths and weaknesses of their peers' presentations through critical analysis and reflection (Garrison et al., 2010). The students were given specific instructions on providing feedback and explained the rubric in the class.
Social Presence	Apart from the teaching and cognitive aspects, the Facebook group allowed students to interact by reacting and commenting in the Facebook group, thereby creating social engagement and emotional attachment (Swan et al., 2009).

Students in both the treatment and control conditions were required to first deliver and record spoken presentations in class and later post those recorded presentations in the Facebook group. In the treatment condition, participation in the Facebook discussion activities was required. In the control condition, participation in the discussion activities was not mandatory. The Facebook group was still maintained for the control group not to take away the benefits of Facebook as an LMS, but the discussion activities were made optional. The students in the treatment condition were divided into six commenting groups (4 or 5 students per group). They were engaged in two Facebook discussion activities during the course. Each group member commented on the posted presentations of the other members of their commenting groups. After students commented, the instructor commented on the strengths and weaknesses of their presentations (see Figure 1 for an example). However, for the control condition, no commenting group was formed, and commenting was not mandatory. It was observed at the end of the course

that no students from the control condition commented on peers' presentations. However, a retrospective look at the group revealed that they viewed and reacted to the presentations.

Figure 1
A Sample Group Discussion from the Treatment Condition
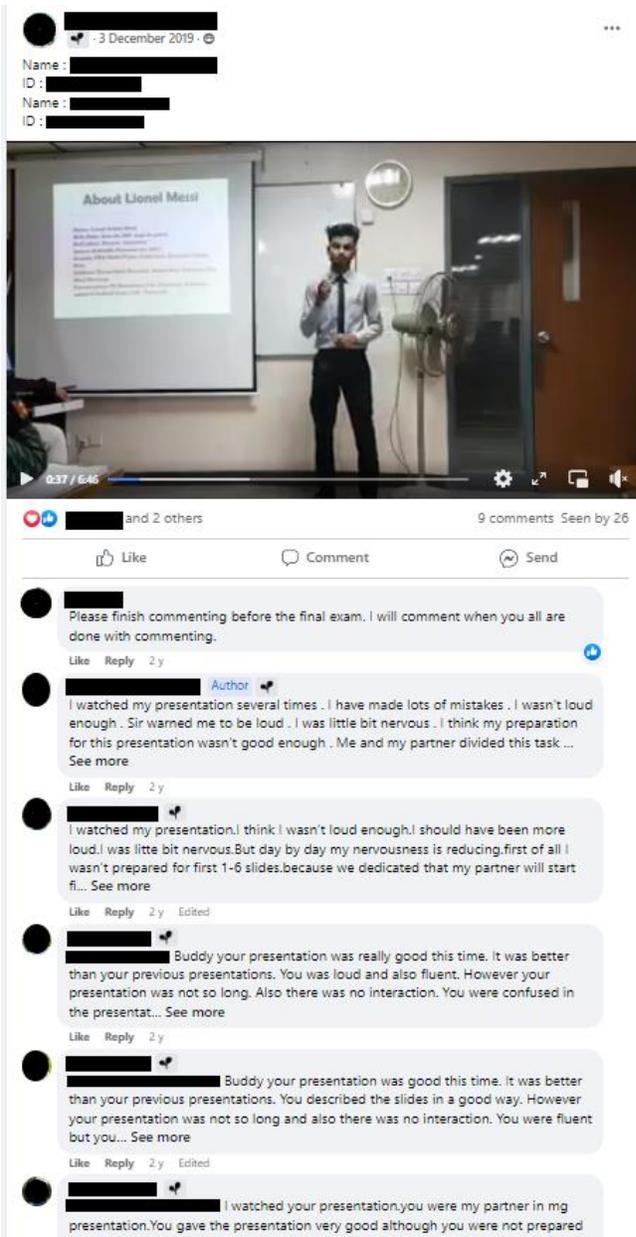
Procedures and Data Sources

Students in both the treatment and control conditions took a speaking assessment three times during the course: mid 1, mid 2, and final assessment. To maintain internal consistency, an instructor-developed rubric was used to score students' presentations for each assessment. There were 20 possible points for each presentation (see Appendix A). One of the researchers randomly checked the presentations using the same rubric for reliability purposes. The interventions for the treatment group took place between the mid 1 and mid 2, and the mid 2 and final assessment. The procedures and data sources for this study are described in the table below:

Table 4
Procedures and Data Sources

No.	Condition	Course Phase	Research Phase	Week and Duration of Presentations	Description of the Phase	Type of Data Source
1	Treatment and Control	Mid 1	Initial Test	4th/5 minutes	The assessment had the students talk about everyday topics (e.g., family, college life) in pairs. It also included narrating a story that they had read.	Speaking performance Assessment Points (RQ2)
2	Treatment	Discussion activities 1	Intervention 1	6th/2 minutes	The students presented their experiences with the course individually, recorded their presentations in class, and posted those to Facebook. The instructor and peers commented.	The comments of the instructor and students in the Facebook group (RQ1)
	Control	Discussion activities are optional.				
3	Treatment and Control	Mid 2	Mid Test	8th/5 minutes	The students spoke in pairs about everyday topics (e.g., personal experiences, opinions on a subject matter). They also narrated a story that they had read.	Speaking performance Assessment Points (RQ2)
4	Treatment	Discussion activities 2	Intervention 2	10th/4 minutes	Students presented on a topic/person in pairs (e.g., Leonine Messi, Life as a nomad), recorded their presentations in class, and posted those to Facebook. The instructor and peers commented.	The comments of the instructor and students in the Facebook group (RQ1)
	Control	Discussion activities are optional.				
5	Treatment and Control	Final assessment	Post Test	16th week/5 minutes	Students answered questions in pairs related to their course experience in the form of an interview.	Speaking performance Assessment Points (RQ2) Student responses to final assessment questions (RQ3)

Data Analysis

To address the first research question about how the participation in the Facebook discussion activities reflected the CoI framework, the comments of the instructor and students in response to the posted videos in the Facebook group were analyzed thematically using the deductive coding method (Saldana, 2016). The three components of the CoI framework and their subcomponents were used to frame the coding process. Therefore, the deductive codes were social presence (affective expression, group cohesion, open communication), teaching presence (design and organization, facilitating discourse, direct instruction), and cognitive presence (triggering event, exploration, integration, resolution). Every comment posted by the instructor and students was coded at the sentence level and categorized into one or more of the three presences and their subcomponents. For instance, if students started the comment with a greeting (e.g., "hey there"), we categorized it as social presence. If the students commented on their peers' current presentations by reflecting on their previous presentations (e.g., "You have done far better than in your previous presentation"), we put it under cognitive presence. If the instructor and students indicated specific improvement points (e.g., "I think you should work on your conclusion"), we put it under teaching presence. The codes were randomly checked by a second coder, and any disagreements were resolved.

In addressing the second research question, we used the Wilcoxon rank-sum test to investigate if there was a significant difference between the respective assessments of the treatment and control conditions. We used Friedman's test to examine if there was a significant difference between the initial, mid, and post-tests within the treatment and control conditions. These non-parametric tests were used as the response variables (assessment scores) did not follow the normality assumption (see Table 7). We also conducted the Shapiro Wilk test to see whether the response variable followed normal distributions. We found that the p-value was less than 0.05, indicating the variable distribution was not normal.

Table 5
Skewness and Kurtosis for Scores for Each Assessment and Condition

Condition	Assessment	Skewness	Kurtosis
Treatment	Mid 1	-1.3	6.0
	Mid 2	-2.4	9.8
	Final	-2.7	12.1
Control	Mid 1	-0.2	1.8
	Mid 2	0.1	1.6
	Final	0.2	1.8

Students' final assessments in both the control and treatment conditions were conducted in pairs (14 pairs and 11 pairs in the control and treatment conditions, respectively) in an interview format. We generated transcripts from the recordings of students' final assessments. These final assessment responses were transcribed and analyzed thematically to address the third research question. Two cycles of coding were involved in the analysis of the interview data (Saldana, 2016). The first cycle of coding involved inductive coding that emerged from the data about student experiences of participating in the Facebook groups. Some of the example codes were "overcoming mistakes," "video recording allows a close observation," and "Students' inability to judge peers' work." The outcome of the second cycle of coding was to arrive at themes and patterns, which was done through revisiting the data and the first cycle of coding. The analysis process produced four themes: general experience, how the Facebook group was helpful in learning, challenges, and the future of the group. The lead author conducted the initial two cycles of coding, and a second coder checked them for reliability purposes. Disagreements were resolved through discussions.

These qualitative and quantitative findings were compared to see if they were supportive or contradictory to each other. This is how the convergence of data has been ensured in this convergent parallel mixed method design.

Results

Students' and Instructor's Participation in the CoI Informed Discussion Activities
Social Presence

Social presence for our purpose is divided into three categories in alignment with the CoI framework: affective expression (i.e., expression of personal emotion), open communication (i.e., building and sustenance of group commitment), and group cohesion (i.e., learner interaction) (Swan et al., 2009). We observed "affective expression" first and foremost with the videos posted by presenters serving as an indicator of rich media. Similarly, the peer responses and then presenter responses to peers captured the indicator of emphasis to stress a point or just to come across as friendly when delivering feedback. Examples we observed for the cohesive category were found in the peer comments, where students began comments with a greeting or salutation and addressed the presenters by name ("Hi," Hey there," and "Hello"). For open communication the most common examples we observed were acknowledgement and approval. For example, presenters thanked their peers and the instructor for feedback and making a commitment to incorporate feedback into their next presentations. An informal response to their peers: "Thank you bro. Next time I will try my best," and a more formal response to the instructor: "thank you so much sir for the comments and I'll definitely try to rectify my mistakes and do my best in the upcoming presentation." We also noticed that all students started with a positive aspect of the presenters' presentations in general and then touched on more specific positive and improvement points which also signifies approval and encouragement. Before concluding, many students again reemphasized the positive aspects of the presentations. Some of the examples were "Next time, you will do better. Best wishes," "but otherwise you did a good job."

Cognitive Presence

Cognitive presence is operationalized through the Practical Inquiry model, which has four phases: triggering event (e.g., sense of puzzlement), exploration (e.g., information exchange), integration (e.g., connecting ideas), and resolution (e.g., apply new ideas) (Garrison et al., 2000). After being "triggered" by the instructor to comment on their peers' presentations, students' responses to their peers' presentations yielded instances from the "exploration" and "integration" phases through our analysis.

We found many instances when students identified specific aspects of different presentations by "exploring" their peers' presentations. For instance, one student identified specific aspects of one of their peer's presentations:

> You had enough eye contact and you have movements. Day by day you're developing a lot. One thing I like about your presentation is you're not very nervous. If you so, you tackle it so easily.

We found instances of "integration" in the events when students compared their peers' previous presentations with the current presentations and stated how the peers' presentations helped shape their presentations. For example, one student wrote:

> You are far better than your previous presentation. I can clearly see that you are trying so hard to improve your fluency. Like Jannat [another student] said you missed some instructions of sir.

Sometimes students' comments focused on the positive aspects: "And today your speech helps me a lot to prepare my one." Sometimes the comments focused on the improvement aspects "you are fluent but it's not enough," "All i [I] can say sometimes you got stuck while speaking due to nervousness which i totally can understand."

Teaching Presence

Teaching presence refers to "the design, facilitation and direction of cognitive and social processes for the purpose of realizing personally meaningful and educationally worthwhile learning outcomes" (Anderson et al., 2001). Therefore, teaching presence has three components: design and organization (e.g., design and development of learning activities), facilitating discourse (e.g., guiding discussion), and direct instruction (e.g., offering corrections) (Anderson et al., 2001). The "design and development" component of teaching presence was maintained by creating discussion activities following the CoI framework (see the CoI-informed Facebook Discussion Activities" in the Method section).

The "facilitating discourse" component was mostly exhibited by the instructor. This occurred when the instructor asked for more clarification on aspects of students' presentations: "This is quite ok. Don't you think you could make your starting a bit more interesting by interacting with your audience?" "Something went wrong towards the end. What happened? Did you forget? Did nervousness come upon you?" "In fact, your presentation was very short. Can you explain why?" "I have found several grammar errors in your speech. Can you identify them all?"

We found instances of "direct instruction" both from the students and instructor. Some examples from students were, "I think if you practice in front of mirror, it's definitely helpful for you. But your body movement and speaking style is good," "I would like to see you to engage your audience with a bit of interaction. You could do thi[s]," "I think you should work on your conclusion," "I think if you add more words, it will be better," and "Use more words for explaining you journey."

The instructor's response was more comprehensive in nature. For example:

> I must tell that you are very clear and loud in your presentation. And I also think you have tried a lot to overcome your nervousness. Fear and nervousness are something that almost every speakers' experience in the beginning. But I am glad to see that you have taken these difficulties as challenges to overcome. Let me point out to some of the things: first of all, you should interact with your audience in this presentation. You started directly without any engagement with your audience. A few grammar mistakes I have noticed. In the first sentence you said, "I am talk about." I think you should say "I am going to talk about." And a very common mistake that everybody else make like you. That is, the word "response" is used wrongly. We say, "try to respond" and not "try to response." Although you are still nervous but I am hopeful that you are going to be confident towards the end of the course.

Differences in Speaking Performance by Conditions

Through the Wilcoxon Rank Sum Test, we did not find any significant difference in initial test scores between the control and the treatment condition (see Table 6). This indicates that the students performed similarly at the beginning. We also did not find any significant differences in mid-test and post-test scores between the control and the treatment condition. All p-values were greater than 0.05 (see Table 6), indicating no significant difference.

Table 6

Wilcoxon Rank Sum Test Between Control Condition and Treatment Condition

	Mean (SD)		W	p-value
	Control	**Treatment**	**W**	**p-value**
Initial test	16.32 (0.84)	16.41 (1.12)	314.5	0.52
Mid-test	16.41 (1.12)	16.43 (0.60)	306.5	0.59
Post-test	16.61 (1.11)	16.75 (0.48)	305.5	0.76

In addition to the Wilcoxon rank-sum test, we conducted Friedman's test to investigate if there was a statistically significant difference between the tests in the treatment condition. As the p-value was less than 0.05 (see Table 7), we can conclude that at least one pair's score distribution was significantly different. Then, we investigated which pair of exam scores were significantly different using multiple comparison tests. We found that the difference between the initial test and post-test was statistically significant ($p < 0.05$). However, there was no statistically significant difference between the initial and mid-test, and mid-test and post-test.

Similarly, through Friedman's test, we investigated whether there was any significant difference between the tests in the control condition. As the p-value was less than 0.05 (see Table 7), we can conclude that at least one pair's score distribution was significantly different. Then, we investigated which pair of exam scores were significantly different using multiple comparison tests. We found that the difference between the initial and the post-test was statistically significant ($p < 0.05$). However, there was no statistically significant difference between the initial and mid-test, and mid-test and post-test.

Table 7

Friedman's Test in Control Condition and Treatment Condition

	Mean (SD)			c^2 (df)	p-value
	Initial test	**Mid 2**	**Post-test**	**c^2 (df)**	**p-value**
Control Condition	16.32 (0.84)	16.41 (1.12)	16.61 (1.11)	32.91 (2)	< .01
Treatment Condition	16.24 (0.63)	16.43 (0.60)	16.75 (0.48)	37.80(2)	< .01

Student Course Experience
Theme 1: General Experience
Treatment Condition. Most of the students in the treatment condition mentioned that providing and receiving feedback on their presentations in the Facebook group was a unique experience for them. They did not use it for educational purposes before, and they benefited from it. One student said:

> It was very learning, and we came to like overcome our mistakes cause our friend classmates and our friends was there. Like they pointed out our mistakes and our flaws which helped us to overcome all our flaws and what mistakes we were doing.

Control Condition. The students in the control condition also mentioned that the course provided great opportunities to improve their speaking skills. One student mentioned that it helped them overcome some of their problems with speaking: "My first problem was how to present something, then what to say in the presentation, and how to say, but after completing this course, I think I have overcome my problem." Another student talked about how the course helped them learn:

> I started the class, I was so, so much nervous because I was not good in English, but when I continue the class, I realized that it was very good for us and we can learn many things.

Theme 2: How the Facebook Group Was Helpful in Learning

Treatment Condition. The students opined that receiving feedback in the Facebook group was immensely helpful for them to identify the aspects of their presentations that they need to improve: "My partners commenting on my posts, and they gave me the negative sides and the positive sides." The students also thought that listening to other presenters' recording was also helpful: "after listening I think I also improve, my some lackings by listening there and I can pick some good points of their speaking." The students also found recording their presentations helpful for self-evaluation:

> Yeah, so I like video recording is very helpful, helpful for us because in video recording, we also see that our eye contact and our body language or what we present in our presentation.

> The video recording was also helpful to measure how much progress they made between two presentations:

> when I listen my middle one [Mid 1] recording, I found so many mistakes and in mid two, I want to overcome this problem and I want to go reduce my all problems. So what I have faced in mid one recordings then I think after listening Mid 2 recording I found some development on it.

Control Condition. In answering questions related to the usefulness of the Facebook group, most of the participants in the control condition mentioned the benefits of using Facebook. One participant said, "It's useful for us and we upload it in our Facebook group. So, as you can see, my friends, all the group members they can see how I talk, and they can get my mistake." They also talked about the benefits of watching their recorded presentations: observing their body language and comparing their presentation with others. One of them mentioned:

> They didn't comment in my recording in the Facebook group, but they told me that that was the mistake you have done in your recording.

> Comments like this one illustrate that though participants in the control condition did not directly participate in the Facebook group, they informally gave feedback to their peers.

Theme 3: Challenges

Treatment Condition. Most of the participants mentioned that listening to the video or audio recordings to comment was challenging as that required a significant amount of effort.

> But little bit difficult because I have to, I have to listen the recording or watch the video twice or thrice and I have to know what he did and what he presents in and what day, what mistakes he did, what good things they have done.

> Another challenge was making it correct the first time they were recording, as the second attempt was not allowed. Some participants mentioned giving feedback on their peers' presentations as the toughest challenge. Such participants were not sure how perfect their feedback was. One participant voiced:

> Commenting on others' posts is not good because when I supposed to comment, I'm thinking that what should I write on his post because I can't on judge anyone and I am not so good in English, so I feel bad.

This participant shared the feeling of inadequacy to judge the work of his peers due to his shortcomings.

Control Condition. Although commenting was not mandatory for the control condition, they were encouraged to comment or self-evaluate. One of the participants mentioned that evaluating oneself is challenging: "When it comes to the scoring, then it was quite difficult. How could I score myself on my mistakes?"

Although participants in both groups faced or perceived challenges in evaluating their peers, they carried ahead with commenting either online or in person.

Theme 4: The Future of the Facebook Group

Treatment Condition. When asked if they would like to continue the group, all the participants replied that they would like to continue the group. They would like to continue learning English, and they would like to connect with their other classmates. One of the participants shared:

> Because in the next semesters, I will be not in the same course. And it [this group] will be very cool.

When asked if they would support adding the next semester's students to the group, all the participants also replied affirmatively. When a researcher pointed out that new students might laugh at their mistakes, one of the participants mentioned, "let them laugh, because everyone makes mistakes, and we learn from our mistakes." These statements indicate that participants are appreciative of the use of Facebook activities.

Control Condition. When asked the same question, all the participants in the control group also replied that they would like to remain in the Facebook group. They would like to discuss topics related to the English language, and the group was like a family to them. Regarding adding the next semester's students and allowing them to see their mistakes, one participant said:

> I would love to accept that because if nobody tells me about my mistakes, I couldn't get my mistakes and I couldn't solve that.

Discussion

The study explored the students' and the instructor's participation in the CoI-informed discussion activities in the Facebook group. The study also investigated if the use of Facebook discussion activities using the CoI framework had any effect on the speaking performances of students. The study additionally explored the student experiences of participating in the Facebook groups.

Students' and Instructor's Participation in the CoI Informed Discussion Activities

We found instances of all three presences of CoI in the Facebook group for the treatment condition through our thematic analysis. On the other hand, through a retrospective look at the Facebook group for the control condition, we found that although students did not comment on the posted presentations of students, they gave reactions by hitting the "like" or "love" button on the Facebook group. Therefore, we can conclude that the social presence component of the CoI was clearly present in the control condition. As they did not comment on the treatment condition, teaching presence and cognitive presence components for this group could not be determined from the Facebook group. However, in their interviews, many students mentioned they informally provided feedback to each other in person. Therefore, those two presences may have occurred in person. The studies conducted on blended learning and CoI favor this finding. For instance, Akyol et al. (2009) found that there were significant differences in the presences between a blended course and a fully online course, and the in-person component of the blended course accounts for much of the increase in the presences in the blended format.

We found all three instances of the CoI in the Facebook group for the treatment condition. First, the students' greetings, the initial and concluding positive remarks, and the use of emojis were all considered instances of social presence as those helped build an emotional attachment among students (Swan et al., 2009). This finding is in line with Keles (2018), which found that Facebook groups supported social presence. Second, the students' cognitive presence instances have been found through their identification of more specific aspects of their peers' presentations, comparing their peers' presentations at two different points, and how some presentations helped them improve their presentations. This reflective part of cognitive presence is confirmed in the literature as Garrison et al. (2010) defined cognitive presence as "the extent to which learners are able to construct and confirm meaning through sustained reflection and discourse in a critical community of inquiry" (p. 89).

Finally, the students' and the instructor's specific suggestions regarding improving the students' performances were considered the teaching presence component of the CoI. This goes with two of the three subcomponents of the CoI framework: facilitation and direct instruction (Anderson et al., 2001). The remaining component of the teaching presence "design" has been maintained through designing these Facebook discussion activities informed by the CoI. Therefore, instances of strong teaching presence were found in the Facebook group. This finding again resonates with Keles (2018) as they also found that a Facebook group supports the teaching presence of the CoI. All in all, we have found a strong presence of the CoI through its three components in the Facebook group for the treatment condition. This is similar to the studies conducted by Ozturk (2015) and Nazir and Brouwer (2019) that observed a significant relationship between three presences and found a strong CoI respectively in a Facebook group.

Differences in Speaking Performance by Conditions

We found no significant differences in students' speaking performances between the treatment and control conditions. Although there was a significant difference between the initial test and post-test for both the treatment and control conditions, there was no significant difference between the initial test and mid-test, and mid-test and post-test for the groups. Although the mean post-test scores of the treatment condition were slightly higher than that of the control condition, the students of both groups showed statistically significant improvement from the initial test to the post-test. The non-significant finding in post-test scores between the treatment condition and control condition was interesting as students in the treatment condition took part in intensive discussion activities guided by the CoI twice during the semester, which the students in the control condition did not. The findings contradict the studies that implemented a Facebook intervention (Ahmed, 2016; Ping & Maniam, 2015). However, in these studies, the students in the control condition did not have any exposure to Facebook. We believe that both conditions having exposure to a Facebook group was a major reason why we found similar performances.

Student Course Experience

The analysis of students' final assessment responses that focused on their course experience generated further insights. Control group participants' replies to many questions, including the Facebook group's future, were similar to the treatment condition. Participants wanted to continue learning through the Facebook group beyond the course duration. This indicated that though not being the direct beneficiaries of the group through the mandatory discussion activities like the treatment condition, they may have indirectly benefited from the group and improved their performances. Some of the earlier studies conducted on the general efficacy of Facebook for education (Aijan & Hartshorne, 2008; Lim & Richardson, 2016; Mao, 2014) also found that the use of Facebook for general purposes such as sharing resources and using it as a learning management system itself can be beneficial in learning and generating positive perceptions about its use for learning purposes among students. The findings of this study resemble that of Shukor and Noordin (2014), where although the treatment condition improved in the overall scores, they did not find any significant difference in post scores between

the control and treatment conditions. Nevertheless, they considered Facebook an effective platform for improving students' language skills. Additionally, although not on Facebook, they received feedback from the instructor in the class and office hours. Considering all these, it was not surprising that we did not find a significant difference between the treatment and control condition, and the Facebook group played a major role in facilitating their improved performances.

As stated in the assessment interviews, students benefited from the Facebook groups both in the treatment and control conditions. It resembled the findings from the previous studies regarding the general efficacy of Facebook for educational purposes (Kabilan et al., 2010; Omar et al., 2012; VanDoorn & Eklund, 2013; Wang et al., 2012). In more specific terms, the presence of a CoI been observed in both the treatment and control groups either directly or indirectly.

A question can be asked about what is so different between a Facebook platform and a traditional learning management system (e.g., Blackboard, Canvas, Moodle). The fact that students significantly use Facebook and other social media in their daily life can potentially make these platforms both a communication and learning tool for them, which in turn can bring more engagement in educational activities as evidenced by many studies. Kazanidis et al. (2018) made a comparison between Facebook and Moodle as learning management platforms and found that Facebook platform could generate more social presence than Moodle, although students perceived teaching and cognitive presence similarly in these platforms. Future research can investigate more if social presence is a mediating factor in accounting for the differences in learning outcomes between Facebook and traditional learning management systems. In the case of this study context, the instructor used Facebook since a traditional learning management system was not available.

Conclusions

The study has both theoretical and practical implications. Theoretically, it enhances our understanding of the application of the CoI framework in a social media platform in general. More specifically, the study also provides insights into the efficacy of the CoI framework in facilitating language learning on Facebook. From a practical standpoint, the study provides ideas to instructors on how Facebook discussion activities can be structured considering the CoI framework to teach speaking skills. It also presented student experiences using these features, which will make instructors aware of the potential benefits and challenges of Facebook for language learning purposes.

There were a few limitations to this study. First, it was a blended course (a predominantly in-person course with an online Facebook component); students also interacted with their classmates and instructor in physical classrooms. Therefore, the in-person interactions may serve as a confounding factor in the analysis. Next, the audio and video recording experience were relatively new to the students, and it may have caused anxiety and stress among them, which may have subsequently affected their performances. Then, the study used a small sample size (22 for the treatment condition and 28 for the control condition), which makes the study statistically underpowered. Both the conditions had access to a Facebook group, and the difference between the two conditions was mandatory discussion activities for the treatment condition versus the optional discussion activities for the control condition. The use of a small sample size and both conditions having access to a Facebook group may have been a factor in not being able to detect differences between conditions. Lastly, as students' final speaking assessments were conducted in an interview format and about their course experiences, we used these assessment interviews as one of our qualitative data sources. As they were primarily formal assessments conducted by the instructor, the students may not have been completely honest about their experiences.

Future research should include a control group in which students only complete activities in person without the influence of a Facebook group and the treatment group completes the same activities within Facebook. This may provide a more nuanced understanding of the effect of a Facebook intervention. Future lines of research can also investigate if the discussion activities can be implemented to improve other language skills (e.g., reading, writing) or in other disciplines. Future research should also incorporate a larger sample size to improve the statistical power for analysis.

Declarations
Ethical concerns were addressed through approval of this research project from the Institutional Review Board (IRB) of the university.

The authors have no conflicts of interest to disclose.

References

Ahmed, M. A. (2016). Using Facebook to develop grammar discussion and writing skills in English as a foreign language for university students. *Sino-US English Teaching*, *13*(12), 932-952. https://doi.org/10.17265/1539-8072/2016.12.004

Aijan, H., & Hartshorne, R. (2008). Investigating faculty decisions to adopt web 2.0 technologies: Theory and empirical tests. *The Internet and Higher Education, 11*, 71–80. https://doi.org/10.1016/j.iheduc.2008.05.002

Akyol, Z., Garrison, D. R., & Ozden, M. Y. (2009). Development of a community of inquiry in online and blended learning contexts. *Procedia-Social and Behavioral Sciences*, *1*(1), 1834-1838. https://doi.org/10.1016/j.sbspro.2009.01.324

Alhajaji, B. H., Algmadi, J. S., & Metwally, A. A. (2020). Exploring the success of GMT technique: Games, mind-mapping, and Twitter hashtags in teaching vocabulary in EFL higher education environment. *International Journal of Higher Education*, *9*(3), 290-299. https://doi.org/10.5430/ijhe.v9n3p290

Almuwayshir, R. K. (2021). Academic summarization via "Twitter" in a college EFL context. *Open Access Library Journal*, *8*(4), 1-16. https://doi.org/10.4236/oalib.1107273

Anderson, T., Liam, R., Randy, G. D., & Waiter, A. (2001). Assessing teaching presence in a computer conference context. *Journal of Asynchronous Learning Networks*, *5*(2), 1-17. https://doi.org/10.24059/olj.v5i2.1875

Auxier, B. & Anderson, M. (2021, April 7). *Social media use in 2021*. Pew Research Center. https://www.pewresearch.org/internet/2021/04/07/social-media-use-in-2021/

Awada, G. (2016). Effect of WhatsApp on critique writing proficiency and perceptions toward learning. *Cogent Education*, *3*(1), 1264173. https://doi.org/10.1080/2331186x.2016.1264173

Aydın, S., & Özdemir, E. (2019). A qualitative research on foreign language learners' perceptions of Facebook as a learning environment. *Language and Technology*, *1*(1), 16-29. https://dergipark.org.tr/en/pub/lantec/issue/42816/404825

Baidawi, A. (2016). Using visual media in teaching speaking. *OKARA: Jurnal Bahasa dan Sastra*, *10*(1), 54-65. https://doi.org/10.19105/ojbs.v10i1.811

Balcikanli, C. (2015). Prospective English language teachers' experiences in Facebook: Adoption, use and educational use in Turkish context. *International Journal of Education and Development Using ICT*, *11*(3), 82-99. https://www.learntechlib.org/p/171323/

Camus, M., Hurt, N. E., Larson, L. R., & Prevost, L. (2016). Facebook as an online teaching tool: Effects on student participation, learning, and overall course performance. *College Teaching*, *64*(2), 84-94. https://doi.org/10.1080/87567555.2015.1099093

Chaffey, D. (2022, June 1). *Global social media statistics research summary 2022*. Smart Insights. https://www.smartinsights.com/social-media-marketing/social-media-strategy/new-global-social-media-research/

Conole, G., Galley, R., & Culver, J. (2011). Frameworks for understanding the nature of interactions, networking, and community in a social networking site for academic practice. *The international Review of Research in Open and Distributed Learning*, *12*(3), 119-138. https://doi.org/10.19173/irrodl.v12i3.914

Creswell, J. W., & Creswell, J. D. (2017). *Research design: Qualitative, quantitative, and mixed methods approaches*. Sage.

Dabbagh, N., & Kitsantas, A. (2012). Personal learning environments, social media, and self-regulated learning: A natural formula for connecting formal and informal learning. *The Internet and Higher Education*, *15*(1), 3-8. https://doi.org/10.1016/j.iheduc.2011.06.002

Dirjal, A. H., Ghapanchi, Z., & Ghonsooly, B. (2020). Role of social media application in promoting motivation and listening skill of Iraqi EFL learners: a Skype-Based study. *Asian Social Science*, *16*(8), 20-32. https://doi.org/10.5539/ass.v16n8p20

Doan, L. D., & Hamid, M. O. (2021). Economics of English: Examining the demand for English proficiency in the Vietnamese job market. *RELC Journal*, *52*(3), 618-634. https://doi.org/10.1177/0033688219863166

Ellis, R. (1999). *Learning a second language through interaction*. John Benjamins.

Erarslan, A. (2019). Instagram as an education platform for EFL learners. *Turkish Online Journal of Educational Technology-TOJET*, *18*(3), 54-69. https://eric.ed.gov/?id=EJ1223776

Garrison, D. R., Anderson, T., & Archer, W. (2000). Critical inquiry in a text-based environment: Computer conferencing in higher education. *The Internet and Higher Education, 2*(2-3), 87-105. https://doi.org/10.1016/s1096-7516(00)00016-6

Garrison, D. R., Anderson, T., & Archer, W. (2010). The first decade of the Community of Inquiry framework: A retrospective. *The Internet and Higher Education*, *13*(1-2), 5-9. https://doi.org/10.1016/j.iheduc.2009.10.003

Hamad, M. M., Metwally, A. A., & Alfaruque, S. Y. (2019). The impact of using YouTubes and audio tracks imitation YATI on improving speaking skills of EFL learners. *English Language Teaching*, *12*(6), 191-198. https://doi.org/10.5539/elt.v12n6p191

Hamid, S., Waycott, J., Kurnia, S., & Chang, S. (2015). Understanding students' perceptions of the benefits of online social networking use for teaching and learning. *The Internet and Higher Education*, *26*, 1-9. https://doi.org/10.1016/j.iheduc.2015.02.004

Hurt, N. E., Moss, G. S., Bradley, C. L., Larson, L. R., Lovelace, M., Prevost, L. B., ... & Camus, M. S. (2012). The" Facebook" effect: College students' perceptions of online discussions in the age of social networking. *International Journal for the Scholarship of Teaching and Learning*, *6*(2), 1-24. https://doi.org/10.20429/ijsotl.2012.060210

Jin, S. (2015). Using Facebook to promote Korean EFL learners' intercultural competence. *Language Learning & Technology*, *19*(3), 38-51. https://scholarspace.manoa.hawaii.edu/server/api/core/bitstreams/16ec90a9-3d76-4a4e-9d17-3541e27dcae2/content

Kabilan, M. K., Ahmad, N., & Abidin, M. J. Z. (2010). Facebook: An online environment for learning of English in institutions of higher education?. *The Internet and Higher Education*, *13*(4), 179-187. https://doi.org/10.1016/j.iheduc.2010.07.003

Kato, F., Spring, R., & Mori, C. (2016). Mutually beneficial foreign language learning: Creating meaningful interactions through video-synchronous computer-mediated communication. *Foreign Language Annals*, *49*(2), 355-366. https://doi.org/10.1111/flan.12195

Kazanidis, I., Pellas, N., Fotaris, P., & Tsinakos, A. (2018). Facebook and Moodle integration into instructional media design courses: A comparative analysis of students' learning experiences using the Community of Inquiry (CoI) model. *International Journal of Human–Computer Interaction*, *34*(10), 932-942. https://doi.org/10.1080/10447318.2018.1471574

Keles, E. (2018). Use of Facebook for the community services practices course: Community of Inquiry as a theoretical framework. *Computers & Education*, *116*, 203-224. https://doi.org/10.1016/j.compedu.2017.09.003

Khamkhien, A. (2010). Teaching English speaking and English speaking tests in Thai context: A reflection from Thai perspective. *English Language Teaching, 3*(1), 184-190. https://doi.org/10.5539/elt.v3n1p184

Koehler, A. A., & Vilarinho-Pereira, D. R. (2021). Using social media affordances to support Ill-structured problem-solving skills: considering possibilities and challenges. *Educational Technology Research and Development*, 1-37. https://doi.org/10.1007/s11423-021-10060-1

Lantolf, J., & Thorne, S. (2006). S*ociocultural theory and the genesis of second language development*. Oxford University Press.

Lim, J., & Richardson, J. C. (2016). Exploring the effects of students' social networking experience on social presence and perceptions of using SNSs for educational purposes. *The Internet and Higher Education*, *29*, 31-39. https://doi.org/10.1016/j.iheduc.2015.12.001

Liu, Y. (2010). Social media tools as a learning resource. *Journal of Educational Technology Development and Exchange, 3*(1), 101-114. https://doi.org/10.18785/jetde.0301.08

Li, F., Fan, S., Wang, Y., & Lu, J. (2021). Chinese university students' experience of WeChat-based English-language vocabulary learning. *Education Sciences*, *11*(9), 554 (1-12). https://doi.org/10.3390/educsci11090554

Long, M. H. (1996). The role of the linguistic environment in second language acquisition. In W. C. Ritchie & T. K. Bhatia (Eds.), Handbook of research on language acquisition: Vol. 2. Second language acquisition (pp. 413-468). Academic Press.

Mabuan, R., & Ebron Jr, G. (2017, November). Facebook integration into university classes: opportunities and challenges. In *Proceedings of the 31st Pacific Asia Conference on Language, Information and Computation* (pp. 265-273). https://aclanthology.org/Y17-1036.pdf

Mao, J. (2014). Social media for learning: A mixed methods study on high school students' technology affordances and perspectives. *Computers in Human Behavior*, *33*, 213-223. https://doi.org/10.1016/j.chb.2014.01.002

Marzuki, M. J., & Nurpahmi, S. (2019). Using video blog in teaching speaking. *English Language Teaching for EFL Learners*, *1*(1), 13-23. https://doi.org/10.24252/elties.v1i1.7422

Minalla, A. A. (2018). The effect of WhatsApp chat group in enhancing EFL learners' verbal interaction outside classroom contexts. *English Language Teaching*, *11*(3), 1-7. http://doi.org/10.5539/elt.v11n3p1

Mustafa, E. N. E. (2018). The impact of YouTube, Skype and WhatsApp in improving EFL learners' speaking skill. *International Journal of Contemporary Applied Researches*, *5*(5), 18-31. http://www.ijcar.net/assets/pdf/Vol5-No5-May2018/02.pdf

Nair, G. K. S., Rahim, R. A., Setia, R., Husin, N., Sabapathy, E., Abd Jalil, N. A., ... & Seman, N. A. (2012). Malaysian graduates English adequacy in the job sector. *Asian Social Science*, *8*(4), 143-147. https://doi.org/10.5539/ass.v8n4p143

Nazir, M., & Brouwer, N. (2019). Community of inquiry on Facebook in a formal learning setting in higher education. *Education Sciences*, *9*(1), 1-23. https://doi.org/10.3390/educsci9010010

Omar, H., Embi, M. A., & Yunus, M. M. (2012). ESL learners' interaction in an online discussion via Facebook. *Asian Social Science*, *8*(11), 67-74. https://doi.org/10.5539/ass.v8n11p67

Öztürk, E. (2015). Facebook as a new Community of Inquiry environment: An investigation in terms of academic achievement and motivation. *Journal of Baltic Science Education*, *14*(1), 20-33. https://doi.org/10.33225/jbse/15.14.20

Ping, N. S., & Maniam, M. (2015). The effectiveness of Facebook group discussions on writing performance: A study in matriculation college. *International Journal of Evaluation and Research in Education*, *4*(1), 30-37. https://doi.org/10.11591/ijere.v4i1.4489

Rakhmanina, L., & Kusumaningrum, D. (2017). The Effectiveness of video blogging in teaching speaking viewed from students' learning motivation. *Proceedings of ISELT FBS Universitas Negeri Padang*, *5*, 27-34. http://ejournal.unp.ac.id/index.php/selt/article/view/7980

Roshid, M. M., & Chowdhury, R. (2013). English language proficiency and employment: A case study of Bangladeshi graduates in Australian employment market. *Mevlana International Journal of Education*, *3*(1), 68-81. https://files.eric.ed.gov/fulltext/ED543591.pdf

Saldaña, J. (2016). *The coding manual for qualitative researchers* (3rd ed.) Sage.

Shrestha, R. N., Awasthi, J. R., & Pahari, B. R. (2019). Impact of English language proficiency on the quality of job execution of engineers in and outside Nepal: A study at a glance. *Journal of the Institute of Engineering*, *15*(1), 250-256. https://doi.org/10.3126/jie.v15i1.27742

Shukor, S. S., & Noordin, N. (2014). Effects of Facebook collaborative writing groups on ESL undergraduates' writing performance. *International Journal of English Language Education*, *2*(2), 89-99. https://doi.org/10.5296/ijele.v2i2.5868

Social Media—Statistics & Facts. (2021, February 25). Statista. https://www.statista.com/topics/1164/social-networks/#dossierKeyfigures

Swan, K., Garrison, D. R., & Richardson, J. C. (2009). A constructivist approach to online learning: The community of inquiry framework. In C. R. Payne (Ed.), *Information technology and constructivism in higher education: Progressive learning frameworks* (pp. 43-57). IGI global. https://doi.org/10.4018/978-1-60566-654-9.ch004

Yu, L. T. (2018). Incorporating Facebook into an EFL writing course: Student perception and participation in online discussion. *Call-Ej*, *19*, 1-22. http://www.callej.org/journal/19-1/Yu2018.pdf

VanDoorn, G., & Eklund, A. A. (2013). Face to Facebook: Social media and the learning and teaching potential of symmetrical, synchronous communication. *Journal of University Teaching & Learning Practice*, *10*(1), 1-14. https://doi.org/10.53761/1.10.1.6

Vygotsky, L. S. (1986). *Thought and language*. MIT Press.

Wang, Q., Woo, H. L., & Quek, C. L. (2012). Exploring the affordances of Facebook for teaching and learning. *International Review of Contemporary Learning Research, 1(1)*, 23-31. https://doi.org/10.12785/irclr/010103

Appendix A
Rubric for Presentations

Course: ENG 100 (Section: 3): Improving Oral Communication Skills

1. **FLUENCY   3**
   Good fluency 3
   Quite fluent with occasional hesitation and pause 2.5
   Fragmentary 1.5
   Limited fluency 2
   Very poor 1
2. **PRONUNCIATION   3**
   Excellent command over pronunciation and word stress and sentence intonation 3
   Good command with occasional pauses 2.5
   Poor, sometimes even incomprehensible 1.5
   Quite faulty 2
   Very poor 1
3. **LISTENING COMPREHENSION   3**
   Can follow conversation easily 3
   Good command, repetition is required often 2.5
   Can barely follow conversation 1.5
   Understands only familiar fragments 2
   Very poor 1
4. **BODY LANGUAGE   2**
   Positive, with relevant gestures and expressions 2
   Quite ok with occasional irrelevant expressions 1.5
   Negative/arrogant/nervous 0.75
   Not up to the level 1
   Very poor 0.5
5. **ACCURACY   5**
   a) Vocabulary 2.5
      Good use of appropriate words 2.5
      Overall vocabulary range is satisfactory 2
      Very poor choices of words 1
      Frequent use of inappropriate words 1.5
      Very poor 0.5
   b) Grammar/Structure 2.5
      Errors are ignorable 2.5
      Fair command, Main weaknesses: _____ 2
      Meaning is incomprehensible due to errors 1.5
      Inadequate command 1
      Very poor 0.5
6. **CONTENT   4**
   Rich and relevant 4
   Fair command with occasional variation 3
   Poor 1.5
   Can't communicate properly due to lack of knowledge 2
   Very poor 1
7. **STRENGTHS** (at least two)
   i._____   ii._____
8. **WEAKNESSES** (at least two)
   i._____   ii._____

Total Marks (20): _____   Instructor's Signature: _____ _____

Appendix B
Final Assessment Questions for Both Control and Treatment Group

1. What is your overall experience with the ENG 100 course?
2. What is your experience with commenting on Facebook?
3. Were there any challenge or difficulties?
4. What is your experience of recording on mobile devices?
5. What was your experience on listening to your own recording and your peers' recording?
6. Some people say it is a speaking course. Why should we write? What is your opinion on this?
7. Do you think it would be better to post audio comment rather than textual comment?
8. If given a choice, would you do an audio recording or video recording?
9. Our course is over today. What do you think we should do with our group? Should we shut down this group?
10. What about including other people in the group?

The Impact of Multimodal Communication on Learners' Experience in a Synchronous Online Environment: A Mixed-Methods Study

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Abstract
During the COVID-19 pandemic, from early 2020 onwards, the adoption of synchronous online learning increased rapidly. It offers students a unique learning experience, utilizing communication modes from both in-person and asynchronous online classes. This mixed-methods study examined the impact of modes of communication (visual, bodily behaviors, spoken language, and written language) found in synchronous online contexts on students' learning experiences from the perspective of social presence and teaching presence, as well as their satisfaction with synchronous online learning experience. An online survey was distributed first to collect quantitative data. The survey results indicated that four different modes influenced students' communication to a different extent, with written and spoken language being the most effective modes of online communication. These modes were also significantly positively correlated with social presence, teaching presence, and student satisfaction; however, only spoken language was a significant predictor of student satisfaction. In the qualitative phase, semi-structured interviews were conducted to examine students' perceptions of how multimodality affects social presence, teaching presence, and satisfaction with online learning. This led to five major themes and highlighted how multiple modes of communication supports social presence, thereby helping teachers scaffold students. In addition, the online learning context impacts type of instruction, and the reduced distance between teachers and students improves teaching presence; however, the students felt a lack of affective belonging in their online classes. This study also provided implications for course instructors and designers to help them effectively adopt different modes in synchronous online environments and promote social and teaching presence.
Keywords: Multimodality, synchronous online learning, social presence, teaching presence

Online learning grew tremendously during the COVID-19 pandemic, especially throughout 2020, as educational institutions were required to offer online courses (Hodges et al., 2020). Educators increasingly turned to video conferencing technology to teach classes (Henriksen et al., 2020). Thus, synchronous online teaching gained traction, becoming widely adopted (Cheung, 2021). In the context of synchronous online learning, students have access to various communication tools such as in-time communication via microphone, which are often less used in asynchronous online environments. (Hoffman, 2018). The technology and tools in synchronous online environments have provided students with more semiotic resources. In social semiotics, meaning is created not only by language but also by gestures, actions, clothing, social context, and symbols that have significance in a community (Hawkes & Hawkes, 1977; Silverman, 1983). Multimodality refers to a set of semiotic resources that use various modes of communication such as images, gestures, gazes, postures, and digital sources (Jewitt, 2011; Toohey et al., 2015) or an integration of them all (Erfanian et al., 2019). For example, in synchronous online contexts, students can communicate in real time by employing various modalities offered by semiotic resources facilitated by technology, such as chat boxes and microphones (Hoffman, 2018). Also, synchronous, video-based platforms provide instructors and students with the most realistic in-person communication experiences (Lowenthal et al., 2021; Romero-Hall & Vicentini, 2017). The synchronous video-based platforms allow students to communicate orally in real time, exchange messages by typing, and receive timely responses (McBrien et al., 2009). In addition, the webcam enables students to communicate via an array of modes, including postural shifts, gestures, and head movements. Thus, the different modes of communication enhance communication, creating an enriched learning experience for students relative to the asynchronous online learning environments.

This study aimed to examine how multimodal communication impacts students' experiences in synchronous online learning. According to Garrison (2009), the community of inquiry (CoI) framework focuses on the elements of the educational experience. The essential components of this process are social, teaching, and cognitive presences. Since cognitive presence addresses students' development of critical and higher-order thinking (Garrison et al., 2001), the current study only examined the ways in which multimodal communication impacts students' experience in terms of social and teaching presences. In addition, the previous literature has suggested that augmenting communication and interaction between students and instructors provides harmonious learning experience (Kuo et al., 2014). However, the different modes of communication applied within synchronous online learning were not explored sufficiently (Erfanian et al., 2019; Hoffman, 2018), and thus, their impact on students' learning experiences was not thoroughly investigated. Hence, this study aimed to establish how the four modes of communication (i.e., visual elements, written language, spoken language, and bodily behavior) affect students' experiences in synchronous online learning courses.

Review of Literature

Multimodal Theory of Communication
Social semiotics is the study of the social dimensions of meaning and how the processes of signification and interpretation shape individuals and societies (Leeuwen, 2005). That is, social semiotics focus on how social meaning is created in all kinds of forms, such as visual and verbal (Kress & Leeuwen, 2001). In the context of teaching and learning, learning is a process of engagement with a variety of modes (Bezemer & Kress, 2016). The multimodal theory of

communication investigates how people employ multimodal communication during interactions (Hoffman, 2018). Forceville (2020) defined nine types of multimodal communication: (a) visuals, (b) written language, (c) spoken language, (d) bodily behavior, (e) sound, (f) music, (g) olfaction, (h) taste, and (i) touch. However, as Hoffman (2018) observed, multimodality is identical in the contexts of synchronous online classes, asynchronous online teaching, and face-to-face teaching, mainly about four aspects: visuals, written language, spoken language, and bodily behavior. Specifically, in a synchronous online learning environment, visual elements include eye contact, images, videos, or the course material design screens shared by the instructors. Written language comprises chats, emoticons, and icons. Spoken language includes speaking via microphone. Bodily behavior encompasses gestures, postures, facial expressions, and movement (Bezemer & Kress, 2016; Hoffman, 2018), and these four modes were examined in this study.

Some scholars in the field of language education adopted the multimodal theory of communication to analyze students' learning via video conferencing. For instance, according to Meskill and Anthony (2010), real-time text chat could potentially enhance teaching as it combines the spoken mode with written language, visuals, and real time communication. This would enable language instructors to capitalize on the multimodal nature of the teaching medium by offering feedback without interfering with the learning process. However, research into how different modes of communication can impact learners' online learning experiences has been limited to other fields.

In the synchronous online learning environment, multiple modes of communication provide learners with diverse opportunities for synchronous communication. According to Garcia and Jacobs (1999), synchronous communication is dialogic communication that proceeds simultaneously in a shared communicative space, whether physical or virtual. That is, video and audio conferencing, and face-to-face communication, are included in this definition. However, in the current study, only synchronous online communication was discussed. In synchronous online learning, students and instructors can communicate in real-time using multiple modes of communication, such as written text in a chat box and spoken language using the audio tools.

Social Presence and Teaching Presence

Community of Inquiry (CoI) has been widely accepted as a framework to explore and understand students' online learning experiences. This framework comprises three elements: social, teaching, and cognitive presence, and corresponding categories and indicators that define each component of presence (Garrison & Arbaugh, 2007). According to Garrison and Arbaugh (2007), cognitive presence is a cycle of practical inquiry involving learners moving deliberately from understanding a problem to exploring, integrating, and applying it. Social presence, according to Garrison (2009), refers to "the ability of participants to identify with the community (e.g., course of study), communicate purposefully in a trusting environment, and develop inter-personal relationships by ways of projecting their individual personalities" (p. 352). Whereas teaching presence is defined as "the design, facilitation and direction of cognitive and social processes for the purpose of realizing personally meaningful and educationally worthwhile learning outcomes" (Garrison et al., 1999, p. 96).

Studies have often focused on one aspect of presence, or a combination of different types of presences in the online learning environment (e.g., Arbaugh & Hwang, 2006; Liaw & Ware, 2018). However, the majority of research adopting the CoI framework has focused on investigating asynchronous online contexts using text-based communication (e.g., Poquet et al.,

2018). For example, social presence has been examined across a number of studies as a way to analyze the use of text-based online discussion forums (Zou et al., 2021). Additionally, Anderson et al. (2001) and Garrison et al. (1999) analyzed teaching presence in asynchronous online environments. They suggested that teaching presence can be created and sustained in text-based communication despite the absence of non-verbal and paralinguistic cues. Nevertheless, asynchronous text-based communication presents unique challenges to the development of effective teacher presence (Garrison et al., 1999). Although researchers have examined asynchronous online environments (Anderson et al., 2001; Garrison et al., 1999), as Lambert and Fisher (2013) noted, limited studies have focused on investigating synchronous online teaching. Thus, research is needed to look beyond the asynchronous environments and explore how different modes of multimodal communication available in the synchronous online environment impact students' learning.

Research has shown that mode of communication can significantly influence the dynamics of how people communicate (Liaw & Ware, 2018). Students in a community of inquiry, whether synchronous or asynchronous, may tend to project themselves socially and emotionally through communication (Garrison et al., 2001), developing varying degrees of social presence. In addition, the multimodalities considered relate to students' perceived teaching presence, since a lack of communication causes students to perceive of instructors as absent and incapable of coordinating sessions, which results in dissatisfaction with learning (Afolabi, 2016).

Cognitive presence is focused on students' development of critical and higher-order thinking (Garrison et al., 2001). Meanwhile learners' communication is fundamental to developing cognitive presence, as other factors also contribute to their critical thinking skills. For example, group composition significantly enhances cognitive presence (Garrison & Arbaugh, 2007), with students' personalities also being an important variable (Lee & Lee, 2006). Additionally, teaching activities and educational context significantly affect the development of cognitive presence (Garrison & Cleveland-Innes, 2005). Therefore, considering the focus of this study is on multimodal communication, we limited the scope of the investigation to social and teaching presences only.

Online learning contexts could enable students to establish a social presence (Swan et al., 2008). Social presence fosters a sense of belonging that supports an environment in which students can openly communicate with their peers to negotiate a variety of perspectives and confirm mutual understandings. According to Garrison et al. (1999), three sub-dimensions constitute social presence: affective expression, open communication, and group cohesion. Open communication requires students to share their emotions, feelings, beliefs, and values with their peers; group cohesion arises when students develop a commitment to the group that they are in. Affective expression refers to using group work to complete tasks in an online course (Garrison & Arbaugh, 2007). Current literature has shown that video conferencing tools provide opportunities for students to interact with their peers and instructors, and thus enhance their experiences of social presence (Hoffman, 2018).

Garrison et al. (2001) concluded that although both social and content-related interactions among learners are vital in online learning environments, these elements alone are insufficient to ensure effective online learning; teaching presence is also needed to direct focus in a specific direction. Teaching presence contains three responsibilities: design and organization, facilitation, and direct instruction (Anderson et al., 2001). According to Garrison and Arbaugh (2007), design and organization concern the curriculum and methods determined by the teacher, facilitating refers to instructors supporting conversations that help learners share their understanding, and

direct teaching focuses on mutual discussion. Several studies have suggested that teaching presence is associated with a wide variety of desirable and valuable student outcomes in online learning environments (Turk et al., 2021). For example, Watson et al. (2016) examined instructors' use of teaching presence and discovered that it determined the quality of student learning experiences. A meta-analysis by Martin et al. (2022) found that teaching presence was strongly correlated with learners' satisfaction in online and blended learning environments.

Student Satisfaction with Online Courses

Student satisfaction can be defined as perceptions of a learning experience and perceived value of the education received (Astin, 1993). In traditional face-to-face learning environments, several factors have been identified as determining student satisfaction with learning, including communication with instructors and students' social experiences with peers (Bolliger & Martindale, 2004). However, the online learning environment has made it more challenging for students to establish relationships with their instructors and fellow students (add citations). Bolliger and Martindale (2004) identified the following factors as contributing to student satisfaction learning online: instructor issues, communication, technology, course management, and interactivity. Other research has shown that student satisfaction with online learning has a strong positive correlation with instructors' performance, particularly availability and response time (DeBourgh, 1999). If there is a lack of communication and interaction with instructors and fellow students, distance learners may experience feelings of isolation and high levels of frustration and anxiety, resulting in dissatisfaction with the learning experience (Mood, 1995). A recent study by Landrum et al. (2021) also supported that student satisfaction with online courses relates to how they interact with faculty and peers. However, having limited or no interaction with peers and instructors resulted in negative perceptions of online learning and lower satisfaction levels with the course (Stewart et al., 2022).

Some researchers have pointed out that augmenting interaction can improve students' perceived satisfaction with learning and that interaction is a key variable influencing student satisfaction in online learning environments (Bray et al., 2008). Additionally, the social interaction and collaboration in both synchronous and asynchronous online learning environments often create a positive learning experience and promote satisfaction (Bolliger & Martindale, 2004). Moreover, Kuo et al. (2014) determined that interactions among learners and among instructors and learners are the most important contributors to student satisfaction in synchronous online courses. With the popularity of synchronous online teaching in higher education and existing literature indicating that synchronous online learning promotes interaction, it is worthwhile to investigate how multimodal communication in this online teaching format impacts learners' satisfaction.

In summary, although some research has investigated multimodality, social presence, and teaching presence in video conferencing in language classes (e.g., Satar, 2015, 2020), few studies have examined the impact of the multiple modes of communication available in the synchronous online context and how they variously affect social presence and teaching presence in other subjects or the broader context of online classes. Therefore, the current study adopted CoI and the multimodal theory of communication as theoretical frameworks, to establish whether four communication modes (visuals, written language, spoken language, and bodily behavior) impact teaching and social presence via communication in synchronous online contexts.

The overarching research question of this study is "How do different modes of communication (i.e., visuals, written language, spoken language, and bodily behavior) impact learners' communication in synchronous online courses and how do they influence learners' social presence, teaching presence, and satisfaction?" The three following aspects will be considered when answering this question:

(1) How is students' communication in the synchronous online environment impacted by different modalities?
(2) What is the relationship between multimodality, social presence, teaching presence, and students' satisfaction in synchronous online classes?
(3) What are students' perceptions of the impacts of different modes (i.e., visuals, written language, spoken language, and bodily behavior) on their perceived social and teaching presences in a synchronous online class?

Methods

A sequential mixed-methods explanatory research approach (Tashakkori & Teddlie, 2003) to both data collection and analysis was implemented to answer the research questions. Quantitative data were first collected and analyzed, followed by qualitative data, since qualitative data helped explain and elaborate on the quantitative results obtained in the first phase.

Data Collection

First, a survey (see Appendix A) was distributed at the end of the fall semester of 2021 to undergraduate students in the School of Liberal Arts in two universities in southwest China. Those students took synchronous online courses during the COVID-19 pandemic in 2020. DingTalk (https://www.dingtalk.com/en) was the online communication platform used by those two universities. Various features available in this platform allowed synchronous communication, including instant chat messages, emoticons and files, and video and audio conferencing.

The online survey consisted of four parts which measured students' social presence, teaching presence, their perceived effectiveness of each of the available modes of communication (i.e., visual, bodily behaviors, spoken language, and written language) in the synchronous online learning environment, and their satisfaction with synchronous online learning. The CoI survey instrument (Arbaugh et al., 2008) was used to measure students' social and teaching presence, and four items were modified to make the survey more appropriate for synchronous online teaching. The adapted version of the questionnaire was piloted among five students and it was decided that no further revisions were needed. Participants were asked to rate items of social and teaching presences and the impacts of modes of communication on a five-point Likert scale, ranging from one (strongly disagree) to five (strongly agree). The Cronbach α for the reliability of the three constructs for this sample in the survey is 0.90 (multimodal), 0.94 (teaching presence), and 0.93 (social presence), respectively. Students were also asked to rate their satisfaction with synchronous online teaching on a ten-point scale and answer two short open-ended questions about the aspects they were most and least satisfied with regarding synchronous online teaching.

Two hundred forty-three students completed the survey, and the response rate was 67.5% ($N = 360$). Of the 243 respondents, seven students agreed to participate in a follow-up interview

conducted in the spring semester of 2022. Descriptive demographics of the students who completed the survey are demonstrated in Table 1.

Table 1
Participant Information

	Category	*n*	*%*
Demographics			
Gender	Male	76	31.28%
	Female	167	68.72%
Grade	Freshman	86	35.39%
	Sophomore	63	25.93%
	Junior	45	18.52%
	Senior	49	20.16%
Online course experience [a]	Synchronous online class	31	12.76%
	Asynchronous online class	34	13.99%
	Hybrid	91	37.45%
	No	87	35.80%

[a] When students selected "synchronous online class" or "asynchronous online class," they indicated they had taken only that particular type of online class before. Those who chose hybrid had experience taking both synchronous and asynchronous or blended online courses.

Second, to further explore and interpret the results from the survey (Creswell & Clark, 2017) and understand students' perceptions of synchronous online learning, semi-structured interviews were conducted with students who agreed to participate in a follow-up interview. The selection of interview participants for the qualitative phase and the development of the interview protocol was based on the results of the quantitative phase. After analyzing the quantitative data, we found that both social presence and teaching presence were associated with students' level of satisfaction; thus, we decided to purposefully select interviewees according to their satisfaction with synchronous online learning. Four students were purposefully invited to participate in the interviews. Two of them were chosen from those with high satisfaction with the synchronous online course, and the other two had low satisfaction levels. Appendix B presents a semi-structured interview protocol, that was revised based on the survey results. From a phenomenological perspective (Husserl, 1962), the qualitative phase aimed to understand how students experienced the synchronous multimodal learning environment. Students were asked about how different modes had impacted their online communication and their experiences of synchronous online learning to understand why certain predictive variables differently contributed to students' stratification of synchronous online teaching. The interviews were conducted during the Spring semester of 2022. Each interview ranged from 15 to 20 minutes. Using the interview protocol as a guide, but depending on each interviewee's experiences, researchers adjusted follow-up questions to elaborate on interviewees' views and experiences. Before conducting interviews, the interview protocol was pilot tested on one student and made modifications. Using the interview protocol, one researcher conducted all interviews to ensure

that they were conducted consistently. The interviews were conducted via video conferencing and audio-recorded.

Data Analysis
Quantitative Data Analysis

R was used to analyze the quantitative survey outcomes, including demographics and participants' responses. For the first research question, descriptive statistics and analysis of variance (ANOVA) were conducted to determine whether a difference existed between different modes that impact student communication in the synchronous online environment; Tukey HSD was applied for post hoc pairwise-comparison. Regarding the second research question, Spearman's rank correlation was used to examine the relationships among multimodality, social presence, teaching presence, and satisfaction. Also, this study used multiple regression to find the predictors of students' satisfaction with synchronous online teaching and examined if social presence, teaching presence, and multimodality can predict students' satisfaction. Assumptions of multiple linear regression were tested using the data before performing the analysis, and all assumptions were met.

Qualitative Data Analysis

Two researchers coded the responses and reported the themes from the two open-ended questions to demonstrate students most favorite and least favorite parts of synchronous online learning. To analyze the interviews, researchers transcribed verbatim the recordings and followed Corbin and Strauss's (1990) guidelines in interview data analysis. First, two researchers coded two interviews independently to generate a list of initial codes and definitions. Then, the two researchers compared and discussed the list of codes to ensure both of them agreed with the code definitions and made necessary changes to the coding. Using the agreed codes and definitions, the researchers proceeded to code the rest of the interviews. Each interview was coded by two, and the constant comparative method (Glaser & Strauss, 2017) was adopted during the coding process. Codes were further analyzed to categorize them into themes by two researchers (Merriam & Tisdell, 2015). The researchers compared codes and themes to determine similarities and differences, revisited the raw data, and made necessary adjustments by modifying, realigning, and refining the codes and themes until 100% agreement on the codes and themes was achieved to enhance trustworthiness (Miles et al., 2013). Additionally, trustworthiness was also secured by member checking (Creswell & Poth, 2016); the summary of the findings was sent to the interviewees for checking.

Results

Impacts of Different Modalities

Descriptive statistics demonstrated that the communication modes represented in the survey questions impact student communication in the synchronous online environment differently. Table 2 summarizes the effectiveness of the different modes on communication. The students benefited most from the written language provided by tools such as chat boxes, while visuals influenced their communication the least.

Table 2
Multimodality on Communication

	Mean	SD
Visuals	3.16	0.83
Written language	3.55	0.71
Spoken language	3.42	0.8
Bodily behaviors	3.34	0.84

A one-way between subjects ANOVA was conducted to compare the effects of four modes on communication, which presented a significant difference between groups (F (3, 968) = 10.11, $p < .001$). Comparisons of means using the Tukey HSD test are summarized in Table 3, indicating that there were significant differences between written language and visuals ($t = 5.365$, $p < .001$), spoken language and visuals ($t = 3.633$, $p < .01$), and bodily behaviors and written language ($t = -2.838$, $p < .05$).

Table 3
Differences in Means for the Four Modalities

Contrast	Mean Difference	SE	95% CI
Visuals versus Written Language	0.389***	0.072	0.202, 0.576
Visuals versus Spoken Language	0.263**	0.072	0.077, 0.450
Visuals versus Bodily Behaviors	0.183	0.072	-0.003, 0.370
Written Language versus Spoken Language	-0.126	0.072	-0.312, 0.061
Written Language versus Bodily Behaviors	-0.206*	0.072	-0.0392, -0.019
Spoken Language versus Bodily Behaviors	-0.08	0.072	-0.267, 0.106

*** $p<0.001$, ** $p<0.01$, *$p<.05$

Relationships Between Multimodality, Social Presence, Teaching Presence, and Satisfaction

Spearman's rank correlation was used to examine the relationships among multimodality, social presence, teaching presence, and satisfaction. The findings revealed that all correlations were positive and statically significant (see Table 4). Specifically, two modes (i.e., visual and bodily behaviors) were moderately correlated with the social presence, teaching presence, and students' satisfaction with synchronous online teaching, while the other two modes (i.e., written language and spoken language) were strongly correlated with the social and teaching presence, but moderately correlated with online teaching satisfaction. Meanwhile, both social presence ($r = 0.589$, $p < .01$) and teaching presence ($r = 0.566$, $p < .01$) were strongly correlated with online teaching satisfaction.

Table 4
Correlations for Multimodality, Social Presence, Teaching Presence, and Satisfaction

Variable	1	2	3	4	5	6	7
1. Written Language							
2. Visual	0.514**						
3. Bodily Behaviors	0.554**	0.805**					
4. Spoken Language	0.582**	0.559**	0.574**				
5. Social Presence	0.511**	0.360**	0.393**	0.529**			
6. Teaching Presence	0.559**	0.444**	0.474**	0.589**	0.699**		
7. Satisfaction	0.422**	0.384**	0.379**	0.346**	0.589**	0.566**	

** $p<0.01$

Previous studies (e.g., Garrison & Arbaugh, 2007) discovered that teaching presence could determine student satisfaction with online learning. This study used multiple regression to find the predictors of student satisfaction with synchronous online teaching. The results of multiple regression analysis showed that $R^2 = 0.4908$, suggesting that the predictive variables can explain 49.08% of the variance in the dependent variable (satisfaction) ($F = 37.92$, $p < .001$). As revealed in Table 5, both teaching and social presence predicted student satisfaction with synchronous online teaching. However, regarding different modes, only spoken language was a statistically significant predictor.

Table 5
Regression Analysis for Teaching Presence, Social Presence and Multimodality and Satisfaction with Synchronous Online Teaching

Effect	Estimate	ES	95% CI		p
			LL	UL	
Intercept	-0.748	0.511	-1.754	0.259	0.145
Teaching Presence	0.918	0.207	0.511	1.325	0.000***
Social Presence	0.964	0.171	0.627	1.301	0.000***
Written Language	0.201	0.152	-0.099	0.501	0.189
Visual	0.147	0.169	-0.185	0.480	0.383
Bodily Behaviors	0.152	0.169	-0.181	0.485	0.368
Spoken Language	0.336	0.143	0.054	0.618	0.019*

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

Students' Perception and Experiences

Regarding the open-ended questions, students were asked what aspects of the synchronous online class they liked. As shown in Table 6, the most frequent code was convenient, accounting for 35.02%, and 13.23% of codes ($n = 34$) represent social presence. Students responded that they were more likely to communicate in the online environment and felt less nervous. For instance, one student wrote, "I can freely express my own opinions in online class." Another responded, "It is less nervous to answer my instructor's questions in online class, and more students have the opportunity to answer the question." Besides, 10.89% of

codes ($n = 28$) related to the multiple modes of communication available in their online classes facilitated communication with peers and teachers. For example, one student wrote, "I could type in my thoughts and opinions while having the class and simultaneously displays the comments on everyone's video screen." Another student reported, "I was more confident to express my thoughts in the online class because I can see others through the webcam." Moreover, 9.73% ($n = 25$) of the codes represent teaching presence.

Table 6

Students' Satisfaction and Unsatisfaction of Online Learning

Codes	Frequency	
	n	*%*
Satisfaction		
Convenient	90	35.02%
Social Presence	34	13.23%
Affective Expression	5	14.71%
Open Communication	25	73.53%
Group Cohesion	4	11.76%
Multiple Modes	28	10.89%
Flexibility	27	10.51%
Teaching Presence	25	9.73%
General	9	36.00%
Direct instruction	11	44.00%
Design and organization	4	16.00%
Facilitation	1	4.00%
Others	22	8.56%
No	22	8.56%
Self-efficacy	9	3.50%
Unsatisfaction		
Lack of Self-efficacy	52	20.31%
Technical issues	47	18.36%
Teaching presence	40	15.63%
Social presence	38	14.84%
No	31	12.11%
Others	18	7.03%
Modes	23	8.98%
Not motivated	4	1.56%
Not convenient	3	1.17%

Note: n represents the number of codes; % represents the proportion of codes

In terms of unsatisfied aspects of synchronous online learning, the most frequent code was lack of self-efficacy ($n = 52$, 20.31%). Students also reported that technical issues ($n = 47$, 18.36%) are one of the most bothersome aspects of synchronous online classes. Among the

unsatisfaction reasons, modes accounted for 8.98% of the codes, and some students reported that physical face-to-face communication was still missing in the synchronous online learning environment.

Four students (three female and one male) were invited for a semi-structured interview (see Table 7). Two of them had low satisfaction levels with the synchronous online courses they took while the other two had a high level of satisfaction.

Table 7
Demographics for Interview Participants

	School Year	Gender	Technological skills and experiences	Online course experiences before the pandemic	Satisfaction level
Student A	Junior	Female	Good	No	Low
Student B	Junior	Male	Good	Yes	High
Student C	Sophomore	Female	Good	No	High
Student D	Junior	Female	Moderate	No	Low

Five major themes emerged from the qualitative analysis of the interviews regarding student perceptions of the impacts of multimodality on their experiences with synchronous online classes: (a). Multimodality supports social presence and communication with peers, (b). Closer visual distance between the instructor and students improves teaching presence, (c). Multimodality provides teachers with more ways to facilitate students and demonstrate learning materials, (d). Online mode impacts instructors' instructions, (e). Lack of affective belonging in the online classes.

Theme 1: Multimodality Supports Social Presence and Communication

The major theme from the interview data was that multi modes of communication supports social presence and communication. A majority of participants reflected that they could use the multiple modes of communication online to show support and acknowledge the presence of peers, as shown in the following quotes. For example, student A stated, "The chat is a good way for us to communicate online. Although I cannot meet my classmates in person, I feel I am studying with them." Student C also commented:

> If other classmates were talking, I would nod my head, like that, to show my support if I agreed with them. I don't think this could happen in the classroom…But maybe I think that when I'm online, because other classmates can see my face, they can see my support. So I would love to have that feedback.

Worth mentioning is that, among the four participants, Student B was the one who had previous experience taking an online course. He described:

> I used to take a (self-paced) asynchronous online course before; in that course, I watched videos by myself and did some assignments. I like that format as well, but sometimes I wanted to collaborate with others and discuss problems with other students…Unfortunately, in asynchronous, I am unable to do that, but in the (synchronous) online class, I can send chat messages to my friends.

Based on the response of student B, a reason the student in synchronous online classes had a higher satisfaction level might be due to the sense of social presence and being connected after taking asynchronous self-paced online classes.

The participants also expressed that the multiple modes online provided them with more ways to interact and communicate with peers in online classes, as indicated in the following quotes. For example, student D stated, "When my classmate is talking, other students can also express their opinions in the chat, contributing to the discussions." According to student C,

The multiple modes in the synchronous online course are good since I have various choices. I did not use all the modes to communicate, but at least I have some options.

Theme 2: Closer Visual Distance Between the Instructor and Students Improves Teaching Presence

Students noted that their perceived physical distance with the course instructors was much closer in the online environment than in the classroom. In particular, the physical distance between students and the course instructor was too great for those attending lecture courses in the big lecture hall. Students could not see the instructor's facial expressions and maintain eye contact. Hence, some students believed that the online format provided a closer visual distance. As a result, it might help them perceive the instructor's teaching presence is promoted through online direct instructions. According to student A,

But regarding learning knowledge, I think online classes are okay because I feel that my teacher is closer to me. It's more like talking to myself one-on-one. In the face-to-face classroom, I used to feel that my teachers were far away from me, and I couldn't have eye contact and see their facial expressions.

Theme 3: Multimodality Provides Teachers with More Ways to Facilitate Students and Demonstrate Learning Materials

In comparison to in-person classes, students also noted that the online classes offered instructors different ways to demonstrate course content and teaching materials. Some students stated that the online format compelled instructors to use more technology; to some degree, integrating technology makes teaching more fun and effective. Student B noted, "I think taking classes online gives teachers the opportunity to use different technological tools to present the course content, which actually makes the content more vivid."

Additionally, multimodality enhanced student engagement in the online class since the instructor could apply multiple modes for students to participate, such as emoticons and chat. On the other hand, students can ask questions in multiple modes and receive instructors' in-time feedback. Student C reflected:

One good thing is that in the online class, we can use chat to come up with some ideas or some quick answers to questions.…I think it was very engaging.…I think online classes provide multiple channels for everyone to communicate and exchange. In the classroom, this form is relatively simple; that is, the teacher talk and the students answer.

Similarly, student D also mentioned, "If I have questions, I would love to unmute myself to ask. I felt it is more convenient to ask questions in the online class, and I can get my teacher's feedback timely."

Theme 4: Online Mode Impacts Teachers' Instructions

The participants also noted that, unlike face-to-face in-person classes, instructors in online courses need to deal with different teaching modes, such as sharing a screen to show PowerPoint slides and tracking if there are any questions in the chat. Those multiple-tasks online impacted the instructor's teaching. As one student stated, "Sometimes, I can feel that my teachers are busy or frustrated in teaching, which may impact their teaching, they cannot focus. They need to answer the chat, control PPT, move around screens, and so on." To some degree, the students believed that the multiple tasks in online classes decreased teachers' quality of instruction. They also pointed out that if a teaching assistant provided support for the instructor, it would be helpful. However, not all their classes have a teaching assistant; most of the time, the instructor must control everything. The students mentioned that the technical issues faced by online teaching instructors also influenced their instructions. For example, one student pointed out, "Teachers' instruction is a little different. We need to log in to the meeting room, and sometimes my teacher has some technical issues, which waste a lot of time."

Theme 5: Lack of Affective Belonging in Online Classes

Students also noted that even though they met synchronously face-to-face in the online class, they still felt isolated. In particular, they believed that seeing each other played an essential role in social connections. If other students turned off the camera, they could not have good communication experiences and feel isolated and lonely in class. For instance, one student emphasized that "Seeing my classmates' faces can also enhance our bond." Thus, online learning experiences lacked affective belongings. This was also a critical factor that made them miss the in-person learning experience. However, the affective belonging was better, and they could feel they were studying together with peers instead of studying alone. For example, student D stated, "some of my classmates did not turn on their camera when having online classes, so sometimes I feel I am having a class alone online and can only hear and see my teacher." Student C also mentioned:

> I would prefer to turn my camera on, and my classmates can turn the camera on too. I can feel that we are sitting in the same room. But in reality, not everyone in the class turns the camera on. I felt a little bad when I need to talk to black screens, instead of seeing everyone's face.

Discussion

The Impacts of Different Modes of Communication

The quantitative findings of this study revealed that the modes of communication impacted students' interactions in synchronous online classes differently. More specifically, written and spoken languages were privileged in synchronous online communication, which aligns with Hoffman's (2018) findings that those two modes dominate synchronous online communication. In the interview, students indicated that multimodality supported communication with peers and instructors because in synchronous online classes they can use

multiple modes to communicate. As indicated in previous literature, a wider range of communication modalities copes better with different students' interaction preferences (Angelone et al., 2020; Wang & Huang, 2018). According to a participant, "when my classmate is talking, other students can also express their opinions in the chat, contributing to the discussions." Besides, visual and bodily behaviors could play important roles in supporting student online communication since these behaviors reduces psychological distance and positively influences student participation (Bozkaya, 2008), which is also reflected in the interviews. For example, students emphasized that they could nod their heads and use facial expressions to support their peers and express their opinions. Additionally, the multiple channels supported by technology in the synchronous online environment made it possible for students to have real-time communication in different ways due to reduced physical distance (McBrien et al., 2009). Overall, the diverse choice of communication channels for written and spoken languages provided by the instructors could benefit distance students and enhance their online learning communication.

Furthermore, this study indicated that multimodality played a role in creating a sense of belonging in the online learning environment. Given participants' comments on their feelings of togetherness and involvement, seeing each other made them feel they were studying together. These results can be explained by the fact that people feel social connectedness to others if they believe they are doing the same things simultaneously (Marsh et al., 2009), which enhances affiliation (Lumsden et al., 2014). In this study, students expressed that they acknowledged agreement, showed their support in the online learning environment by using different modes, and felt involved in the interaction when their peers responded as well. Therefore, instructors need to cultivate an atmosphere that allow learners to feel that their online peers are participating in the classes and are involved in the communication (Satar, 2015).

The Relationships Between Multimodality, Social Presence, Teaching Presence, and Satisfaction

The results showed significant positive correlations between students' perceived effectiveness of all four modes of communication, social presence, teaching presence, and satisfaction. Moreover, the regression outcomes showed that social presence, teaching presence, and spoken language were significant indicators of satisfaction.

The significant positive correlation comports with the study conducted by Garrison (2009), indicating that the more effectiveness students perceive of each modality, the more they will be willing to communicate purposefully and develop inter-personal relationships. The context of this study was synchronous online courses, which differ from asynchronous online courses in that students can see and communicate in real-time (Hoffman, 2018; Peterson et al., 2018). Students in the interviews reported that seeing their peers during the class helped them improve social presence: "I would like to see everyone's face and other body behavior. So if I can see those, they will help me feel more confident when answering questions." Another student mentioned the benefits of visible bodily gestures via real-time online tools: "If other classmates were talking, I would nod my head, like that, to show my support if I agreed with him/her…. I would love to have that feedback." These results resonate with Satar (2020) who claimed that video conferencing tools, such as Zoom, provide opportunities for real-time peer interaction, and thus enrich learning experiences. In addition, students in synchronous online contexts can also chat in real-time (written language): "sometimes I wanted to collaborate with others and discuss problems with other students, like how we did in classrooms. Unfortunately, in asynchronous, I

am unable to do that, but in the online class, I can send chat messages to my friends." This outcome echoes the previous finding that written language is crucial in supporting students' synchronous online communication (Hoffman, 2018). The more students perceived multimodalities such as gestures or real-time chat as effective, the more they would be involved in interpersonal interaction (Cunningham, 2014).

Furthermore, students' perceived effectiveness of multimodalities is significantly correlated with teaching presence. Students mentioned in the interviews that implementing multimodality enhanced teacher presence during synchronous online courses since it decreases the "distance" of online learning environments which improves students' perceptions of teaching presence (McBrien et al., 2009). For instance, students indicated that the proper application of visuals allowed teachers to present the learning materials better: "I think taking classes online allows teachers to use different technological tools to present the course content, which actually makes the content more vivid." This outcome is similar to the findings from Tichavsky et al. (2015), that when instructors deliver a clear presentation of learning contents, students were more likely to perceive their teaching presence. Moreover, students also indicated the importance of immediacy when communicating with instructors: "One good thing is that in the online class, we can use chat to come up with some ideas, or some quick answers to questions." In fact, communication immediacy is significantly, positively associated with teaching presence (Baker, 2010). Thus, supported by the effectiveness of multimodalities, immediate feedback enhance students' perceived teaching presence, which indicates instructors should employ multimodalities to improve communication immediacy.

In addition, increased modality choices during learning practices could be the reason for positive correlation between students' perceived effectiveness of multimodalities and social and teaching presences. As a student mentioned: "The multiple modes in the synchronous online course are good since I have various choices. I did not use all the modes to communicate, but at least I have some choices if I want to say something." The multimodal environment of the synchronous online courses provided students with enriched learning environments (Hoffman, 2018; Peterson et al., 2018): "I think online classes provide multiple channels for everyone to communicate and exchange. In the classroom, this form is relatively simple; that is, the teacher talks, and the students answer." The synchronous online environment with various modality choices influenced students' behavior and perception of social and teaching presence. As indicated by Wang and Huang (2018), the flexibility of choosing the most comfortable modalities could foster learners' interaction with peers and instructors, which explains the positive correlation between their perceived effectiveness and social and teaching presence. An implication for instructors is that various modalities should be given to learners based on their preferences to maximize learning efficiency.

The regression analysis showed that social presence, teaching presence, and spoken language predicted satisfaction. For social presence, as indicated by Bolliger and Martindale (2004), students should be given functional, usable tools for interaction and should be provided with plenty of opportunities to participate in discussions to feel involved and promote satisfaction. This outcome resonates with the correlational results that different modalities are positively correlated with social presence and satisfaction. Teaching presence is also a significant predictor of satisfaction, which resonates with previous studies (Bray et al., 2008; Kuo et al., 2014), that teaching presence determines the intensity and frequency of feedback and support students receive, which impacts their satisfaction.

Although all four modalities were correlated with satisfaction, only the spoken language was a significant predictor of satisfaction. These findings supplemented previous literature about the associations between modalities and learner satisfaction (Abuhassna et al., 2020; Landrum et al., 2021; Malkawi et al., 2020). Student interviews shed some light on the role of spoken language relating to their satisfaction, for example: "I unmute myself sometimes to answer questions, and if I had questions, I would love to unmute myself to ask. I felt it is more convenient to ask questions in the online class, and I can get my teacher's feedback timely." This finding indicates synchronous online learning supported by real-time video conferencing tools provides students opportunities to interact with peers and instructors in a way that is comfortable for them (Angelone et al., 2020). In other words, students were given choices about the best way for them to communicate, which in return could yield greater social presence (Wang & Huang, 2018). As a student mentioned: "If I am in class, I may not dare to go directly (ask teacher questions), but in front of the computer, I will feel less embarrassed and nervous. I don't need to wait till class ends to ask questions." This finding suggests that to cultivate a more positive learning experience and higher satisfaction, students should be given greater flexibility in verbal communication approaches throughout the learning process.

Conclusion

Synchronous online classes differ from both in-person and asynchronous online classes in terms of communication modes, which provide students with multiple modes to communicate (Hoffman, 2018) and offer students a different learning experience. Thus, it is worth investigating how the various modalities affect students' communication in the synchronous online teaching environment and how that relates to their online learning experience. This study applied a mixed-methods approach to research and presents a holistic overview of how four different modes (i.e., visuals, written language, spoken language, and bodily behaviors) have impacted students' online communication in the synchronous learning context, as well as the relationship with social and teaching presence, and their satisfaction with synchronous online learning. The findings of this study could provide implications for instructors to adopt a variety of modes to promote students' communication with peers and instructors, which enhances teaching presence and give students greater satisfaction with online learning. In addition, the outcomes supported the importance of social presence and teaching presence in synchronous online learning and contributed to the growing body of literature that examines online learning with the community of inquiry framework.

Limitations

Self-report survey data was used in this study to measure the impacts of multimodality on students' online learning experiences. However, there are limitations to using self-reported data (Rosenman et al., 2011). Although self-reported data offer some insights into the phenomenon, they may not provide the full picture of how multimodal impacts students' online interactions. Thus, the analysis of class video recordings may be employed in future studies to examine the interactions in class. Also, in our future study, we will use multiple items to assess students' satisfaction with synchronous online learning instead of a single-item scale to ensure reliability. Additionally, because we did not recruit participants from a particular course for our study, we could not examine how instructors' teaching pedagogies impacted students' learning. In future studies, instructors' pedagogical choices could be explored as a variable in relation to students' learning of multimodal communication. Another limitation of this study is that only four modes

were analyzed. In future studies, a comprehensive analysis of the different modes could be conducted to fully understand how multimodal impacts students' learning in an online environment.

Declarations

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

The authors assert that approval was obtained from an ethics review board (IRB) at the University of Texas at Austin, USA.

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References

Abuhassna, H., Al-Rahmi, W. M., Yahya, N., Zakaria, M. A. Z. M., Kosnin, A. B., & Darwish, M. (2020). Development of a new model on utilizing online learning platforms to improve students' academic achievements and satisfaction. *International Journal of Educational Technology in Higher Education*, *17*(1), 1-23. http://Doi.org/10.1186/s41239-020-00216-z

Afolabi, R.O. (2016). Emphasizing instructor presence in distance learning environments. In S. D'Agustino (Ed.), *Creating teacher immediacy in online learning environments* (pp. 37-55). IGI Global. https:doi.org/10.4018/978-1-4666-9995-3.CH003

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

Angelone, L., Warner, Z., & Zydney, J. M. (2020). Optimizing the technological design of a blended synchronous learning environment. *Online Learning, 24*(3), 222-240. http://dx.doi.org/10.24059/olj.v24i3.2180

Arbaugh, J. B., Cleveland-Innes, M., Diaz, S. R., Garrison, D. R., Ice, P., Richardson, J. C., & Swan, K. P. (2008). Developing a community of inquiry instrument: Testing a Community of Inquiry framework using a multi-institutional sample. *The Internet and Higher Education, 11*(3), 133–136. https://doi.org/10.1016/j.iheduc.2008.06.003

Arbaugh, J. B., & Hwang, A. (2006). Does "teaching presence" exist in online MBA courses?. *The Internet and Higher Education*, *9*(1), 9-21. https://doi.org/10.1016/j.iheduc.2005.12.001

Astin, A.W. (1993). *What matters in college? Four critical years revisited*. Jossey-Bass.

Baker, C. (2010). The impact of instructor immediacy and presence for online student affective learning, cognition, and motivation. *The Journal of Educators Online, 7*(1). https://doi.org/10.9743/JEO.2010.1.2

Bezemer, J., & Kress, G. (2016). *Multimodality, learning, and communication: A social semiotic frame*. Routledge.

Bolliger, D. U., & Martindale, T. (2004). Key factors for determining student satisfaction in online courses. *International Journal on E-learning, 3*(1), 61-67. https://www.learntechlib.org/primary/p/2226/.

Bozkaya, M. (2008). The relationship between teacher immediacy behaviours and distant learners' social presence perceptions in videoconferencing applications. *The Turkish Online Journal of Distance Education*, *9* (1), 180–192. https://dergipark.org.tr/en/pub/tojde/issue/16915/176485

Bray, E., Aoki, K., & Dlugosh, L. (2008). Predictors of learning satisfaction in Japanese online distance learners. *International Review of Research in Open and Distributed Learning*, *9*(3), 1-24. https://doi.org/10.19173/irrodl.v9i3.

Cheung, A. (2021). Synchronous online teaching, a blessing or a curse? Insights from EFL primary students' interaction during online English lessons. *System*, *100*, 102566. https://doi.org/10.1016/j.system.2021.102566

Corbin, J. M., & Strauss, A. (1990). Grounded theory research: Procedures, canons, and evaluative criteria. *Qualitative Sociology, 13*(1), 3-21.

Creswell, J. W., & Clark, V. L. P. (2017). *Designing and conducting mixed methods research.* Sage.

Creswell, J. W., & Poth, C. N. (2016). *Qualitative inquiry and research design: Choosing among five approaches*. Sage

Cunningham, U. (2014). Teaching the disembodied: Othering and activity systems in a blended synchronous learning situation. *The International Review of Research in Open and Distributed Learning, 15*(6), 33–51. https://doi.org/10.19173/irrodl.v15i6.1793

Debourgh, G. A. (1999). Technology is the tool, teaching is the task: Student satisfaction in distance learning. In J. D. Price, J. Willis, D. A. Willis, M. Jost, & S. Boger-Mehall (Eds.), *Proceedings of the Society for Information Technology & Teacher Education International Conference* (pp. 131-137). Association for the Advancement of Computing in Education (AACE).

Erfanian Mohammadi, J., Elahi Shirvan, M., & Akbari, O. (2019). Systemic functional multimodal discourse analysis of teaching students developing classroom materials. *Teaching in Higher Education*, *24*(8), 964-986.

Forceville, C. (2020). *Visual and multimodal communication: Applying the relevance principle.* Oxford University Press.

Garcia, A. C., & Baker Jacobs, J. (1999). The eyes of the beholder: Understanding the turn-taking system in quasi-synchronous computer-mediated communication. *Research on language and social interaction*, *32*(4), 337-367. http://doi.org/10.1207/S15327973rls3204_2

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

Garrison, D. R., Anderson, T., & Archer, W. (1999). Critical inquiry in a text-based environment: Computer conferencing in higher education. *The Internet and Higher Education, 2*(2), 87–105. https://doi.org/10.1016/S1096-7516(00)00016-6

Garrison, D. R., Anderson, T., & Archer, W. (2001). Critical thinking, cognitive presence, and computer conferencing in distance education. *American Journal of Distance Education*, *15*(1), 7-23. http://doi.org/10.1080/08923640109527071

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

Garrison, R. (2009). Implications of online and blended learning for the conceptual development and practice of distance education. *International Journal of E-Learning & Distance Education, 23*(2), 93-104. https://www.ijede.ca/index.php/jde/article/view/471

Glaser, B. G., & Strauss, A. L. (2017). *Discovery of grounded theory: Strategies for qualitative research.* Routledge.

Hawkes, T., & Hawkes, T. (1977). *Structuralism & semiotics*. London: Methuen.

Henriksen, D., Creely, E. & Henderson, M. (2020). Folk pedagogies for teacher transitions: Approaches to synchronous online learning in the wake of COVID-19. *Journal of Technology and Teacher Education, 28*(2), 201-209.

Hodges, C., Moore, S., Lockee, B., Trust, T., & Bond, A. (2020). The difference between emergency remote teaching and online learning. *Educause Review, 27*, 1-12. http://hdl.handle.net/10919/104648

Hoffman, E. B. (2018). Untangling the talk: A new multimodal discourse analysis method to investigate synchronous online learning. *Journal of Digital Learning in Teacher Education, 34*(3), 179–195. https://doi.org/10.1080/21532974.2018.1453895

Husserl, E. (1962). *General introduction to pure phenomenology*. Collier.

Jewitt, C. E. (2011). *The Routledge handbook of multimodal analysis*. Routledge/Taylor & Francis Group.

Kress, G., & Van Leeuwen, T. (2001). *Multimodal Discourse: The Modes and Media of Contemporary Communication*. London: Arnold.

Kuo, Y. C., Walker, A. E., Schroder, K. E., & Belland, B. R. (2014). Interaction, internet self-efficacy, and self-regulated learning as predictors of student satisfaction in online education courses. *The Internet and Higher Education*, *20*, 35-50. https://doi.org/10.1016/j.iheduc.2013.10.001

Lambert, J. L., & Fisher, J. L. (2013). Community of inquiry framework: Establishing community in an online course. *Journal of Interactive Online Learning, 12*(1).

Landrum, B., Bannister, J., Garza, G., & Rhame, S. (2021). A class of one: Students' satisfaction with online learning. *Journal of Education for Business*, *96*(2), 82-88. https://doi.org/10.1080/08832323.2020.1757592

Lee, J., & Lee, Y. (2006). Personality types and learners' interaction in web-based threaded discussion. *Quarterly Review of Distance Education*, *7*(1), 83.

Liaw, M. L., & Ware, P. (2018). Multimodality and social presence in an intercultural exchange setting. In R. Kern & C. Develotte (Eds.), *Screens and scenes* (pp. 256-278). Routledge.

Lowenthal, P. R., West, R.E., Archambault, L., Borup, J., & Belt, E. S. (2021). Faculty perceptions of using synchronous video-based communication technology. *Online Learning, 25*(4), 74-103. DOI: 10.24059/olj.v25i4.2890

Lumsden, J., Miles, L. K., & Macrae, C. N. (2014). Sync or sink? Interpersonal synchrony impacts self-esteem. *Frontiers in Psychology*, 1064. https://doi.org/10.3389/fpsyg.2014.01064

Malkawi, E., Bawaneh, A. K., & Bawa'aneh, M. S. (2020). Campus off, education on: UAEU Students' satisfaction and attitudes towards e-learning and virtual classes during COVID-19 pandemic. *Contemporary Educational Technology*, *13*(1), ep283. https://doi.org/10.30935/cedtech/8708

Marsh, K. L., Richardson, M. J., & Schmidt, R. C. (2009). Social connection through joint action and interpersonal coordination. *Topics in Cognitive Science*, *1*(2), 320-339. https://doi.org/10.1111/j.1756-8765.2009.01022.x

Martin, F., Wu, T., Wan, L., & Xie, K. (2022). A Meta-analysis on the community of inquiry presences and learning outcomes in online and blended learning environments. *Online Learning*, *26*(1). http://doi.org/10.24059/olj.v26i1.2604

McBrien, J. L., Cheng, R., & Jones, P. (2009). Virtual spaces: Employing a synchronous online classroom to facilitate student engagement in online learning. *International Review of Research in Open and Distributed Learning, 10*(3). https://doi.org/10.19173/irrodl.v10i3.605

Merriam, S. B., & Tisdell, E. J. (2015). *Qualitative research: A guide to design and implementation.* John Wiley & Sons.

Meskill, C., & Anthony, N. (2010). *Teaching language online.* Multilingual Matters.

Miles, M. B., Huberman, A. M., & Saldana, J. (2013). *Qualitative data analysis: A methods sourcebook* (3rd ed.). SAGE.

Mood, T. A. (1995). *Distance education: An annotated bibliography*. Libraries Unlimited.

Peterson, A. T., Beymer, P. N., & Putnam, R. T. (2018). Synchronous and asynchronous discussions: Effects on cooperation, belonging, and affect. *Online Learning, 22*(4), 7-25. https://doi.org/10.24059/olj.v22i4.1517

Poquet, O., Kovanović, V., de Vries, P., Hennis, T., Joksimović, S., Gašević, D., & Dawson, S. (2018). Social presence in massive open online courses. *International Review of Research in Open and Distributed Learning, 19*(3). https://doi.org/10.19173/irrodl.v19i3.3370

Romero-Hall, E., & Vicentini, C. R. (2017). Examining distance learners in hybrid synchronous instruction: Successes and challenges. *Online Learning Journal*, *21*(4). http://doi.org/10.24059/olj.v21i4.1258

Rosenman, R., Tennekoon, V., & Hill, L. G. (2011). Measuring bias in self-reported data. *International Journal of Behavioural & Healthcare Research*, *2*(4), 320.

Satar, H. M. (2015). Sustaining multimodal language learner interactions online. *CALICO Journal, 32*(3), 480–507. https://doi.org/10.1558/cj.v32i3.26508

Satar, M. (2020). L1 for social presence in video-conferencing: A social semiotic account. *Language Learning & Technology, 24*(1), 129–153. http://hdl.handle.net/10125/44713

Silverman, K. (1983). *The subject of semiotics*. Oxford University Press.

Stewart, W. H., Baek, Y., & Lowenthal, P. R. (2022). From emergency remote teaching (ERT) to sustained remote teaching (SRT): A comparative semester analysis of exchange students' experiences and perceptions of learning online during COVID-19. *Online Learning*, *26*(2). DOI: http://dx.doi.org/10.24059/olj.v26i2.2661

Swan, K., Shea, P., Richardson, J., Ice, P., Garrison, D. R., Cleveland-Innes, M., & Arbaugh, J. B. (2008). Validating a measurement tool of presence in online communities of inquiry. *e-Mentor, 24*(2).

Tashakkori, A., & Teddlie, C. (2003). Issues and dilemmas in teaching research methods courses in social and behavioural sciences: US perspective. *International Journal of Social Research Methodology, 6*(1), 61-77. http://doi.org/10.1080/13645570305055

Tichavsky, L. P., Hunt, A. N., Driscoll, A., & Jicha, K. (2015). "It's just nice having a real teacher": Student perceptions of online versus face-to-face instruction. *International Journal for the Scholarship of Teaching & Learning, 9*(2), 1–8. https://doi.org/10.20429/ijsotl.2015.090202

Toohey, K., Dagenais, D., Fodor, A., Hof, L., Nuñez, O., Singh, A., & Schulze, L. (2015). That sounds so cooool: Entanglements of children, digital tools, and literacy practices. *Tesol Quarterly*, *49*(3), 461-485.

Turk, M., Müftüoglu, A. C., & Toraman, S. (2021). Teaching presence in online courses: Similar perceptions but different experiences from multiple instructor perspectives. *Online Learning*, *25*(4), 156-177. http://doi.org/10.24059/olj.v25i4.2885

Van Leeuwen, T. (2005). *Introducing social semiotics*. Psychology Press.

Wang, Q., & Huang, C. (2018). Pedagogical, social and technical designs of a blended synchronous learning environment. *British Journal of Educational Technology, 49*(3), 451–462. http://doi:10.1111/bjet.12558

Watson, S. L., Watson, W. R., Richardson, J., & Loizzo, J. (2016). Instructor's use of social presence, teaching presence, and attitudinal dissonance: A case study of an attitudinal change MOOC. *International Review of Research in Open and Distributed Learning*, *17*(3), 54-74. https://doi.org/10.19173/irrodl.v17i3.2379

Zou, W., Hu, X., Pan, Z., Li, C., Cai, Y., & Liu, M. (2021). Exploring the relationship between social presence and learners' prestige in MOOC discussion forums using automated content analysis and social network analysis. *Computers in Human Behavior*, 115, article 106582. https://doi.org/10.1016/j.chb.2020.106582

Appendix A
Survey

Question1:
Gender Identification:

Question 2: Please rate your knowledge about technologies before Spring Break 2020, when classes were conducted in a face-to-face setting.
   a. Very poor
   b. Poor
   c. Acceptable
   d. Good
   e. Very good

Question 3: Before Spring Break 2020, did you take any online courses? [Select All That Apply]
   a. Yes, synchronous online courses
   b. Yes, asynchronous online courses
   c. Yes, blended online course
   d. No

Please answer the following questions based on your online learning experience.
1= strongly disagree, 2=somewhat disagree, 3=neutral, 4=somewhat agree, 5=strongly agree

Multimodal Communication
Question 4:
In my synchronous online classes:
   1. The online chat, emoticons, and icons increase the communication between me and my classmates
   2. Visuals, including eye contact, and the course materials (such as images, and videos) screen shared by the instructor increase the communication between me and my classmates.
   3. Bodily behaviors, for example, body orientation, smiles, head nods, gestures, etc., can help the communication between me and my classmates.
   4. Talking through microphones can help communication between me and my classmates.
   5. The online chat, emoticons, and icons increase the communication between me and instructor.
   6. Visuals, including eye contact, and the course materials (such as images and videos) screen shared by the instructor increase the communication between me and instructor.
   7. Bodily behaviors, for example, body orientation, smiles, head nods, gestures, etc., can help the communication between me and instructor.
   8. Talking through microphones can help the communication between me and instructor.

Teaching presence
Design and organization
Question 5:
In my synchronous online classes:
1. The instructor clearly communicated the course topics.
2. The instructor clearly communicated the learning objectives of the course.
3. The instructor clearly provided instructions on how to participate in the course activities.
4. The instructors clearly provided instructions on how to prepare for the course exams/tests.
5. The instructor clearly stated the due time for tasks.

Facilitation
Question 6:
In my synchronous online classes:
1. The instructor illustrates the learning topics that helped my understanding.
2. The instructor kept students engaged in productive interaction.
3. The instructor kept students on tasks in a way that helped me to learn.
4. The instructor encouraged students to explore new ideas in the course.
5. The instructor reinforced the development of a sense of community among students.

Direct Instruction
Question 7:
In my synchronous online classes:
1. The instructor helped students focus discussions on relevant issues in a way that helped me to learn.
2. The instructor provided feedback that helped me understand my strengths and weaknesses relative to the course goal and learning objectives.
3. The instructor provided feedback in a timely fashion.

Social Presence
Affective Expression
Question 8:
In my synchronous online classes:
1. Getting to know other classmates gave me a sense of belonging to the course.
2. I was able to form distinct impressions of some classmates.
3. Online or Web-based communication is an excellent medium for interaction.

Open Communication
Question 9:
In my synchronous online classes:
1. I felt comfortable communicating through the online platform.
2. I felt comfortable participating in the course discussions.
3. I felt comfortable communicating with my classmates.

Group Cohesion
Question 10:
In my synchronous online classes:
1. I felt comfortable disagreeing with my classmates while still maintaining a sense of trust.
2. I felt that my point of view was acknowledged by my classmates.
3. Course activities helped me develop a sense of collaboration.

Question 11:
Please rate your experiences of the synchronous online courses (from 1-Extremely dissatisfaction -10 extremely satisfaction)

Question 12:
What was the most satisfying part of synchronous online learning?

Question 13:
What was the least satisfying part of synchronous online learning?

Appendix B
Interview Protocol

1. Can you tell me about yourself?
   (e.g., educational background, technological skills)
2. Describe your experience with online learning during the pandemic.
   a. How did it go for you? [prompts: difficult, easy; why?]
   b. What were the major differences between learning online and in the classroom?
[prompts: teachers' instruction? Organization? Your communication?]
3. Describe your experience using the different modes in the online class?
 [prompts: Chatbox, Videos, Microphones, others]
   a. What worked for you? Why?
   b. What did not work for you? Why?
   c. Do you believe the different modes impact your communication with peers/instructors in synchronous online course?
4. Describe your experiences of online communication with your classmates?
   [prompts: any difficulties, why? Compared with in-person communication]
   If you want to communicate with your peers, which modes would you choose? (Chat, unmute yourself?)
5. Describe your experiences of online communication with your course instructors?
   [prompts: any difficulties, why? Compared with in-person communication]
   If you want to ask a question or communicate with your teacher, which modes would you choose? (Asking questions in chat, or unmute yourself?)
6. What did you like best about synchronous online learning? Why?
7. What did you like least about synchronous online learning? Why?

Appendix C
Coding Scheme

Table C

Coding Scheme Adopted in Interview Transcripts and Emerged Themes

Themes	Codes	Descriptions
1. Multimodality supports social presence and communication with peers	Support and encourage	Use of text chat, emoticons, and icons (such as clapping icons), accompanying gestures, and head movement for support and encouragement
	Acknowledge the presence of others	Use of text chat, emoticons, body language, facial expressions to acknowledge the presence of others
	Use multiple modes to communicate	In the online class, students can use multiple modes to communicate with peers
	Contribute to the interaction	Use of text chat, emoticons to interact when others are speaking
	Promote participation	Multiple modes online provided introverted students more opportunities to participate
2. Closer visual distance between the instructor and students improves teaching presence	Make eye contact	Students can have eye contact with teachers when having classes online
	Feel closer in online mode	The perceived distance between instructor and students is closer
	Give direct instructions	Students perceive instructor's teaching presence through their online direct instructions.
3. Multimodality provides teachers with more ways to facilitate students and demonstrate learning	Demonstrate content	The online multimodal environment provides instructors with different ways to demonstrate course content and teaching materials
	Enhance engagement	Multimodality provides instructors with ways to enhance students' engagement in the online class
	Allow students to ask questions and receive feedback	Multiple communication modes online allow students to have more ways to ask questions and receive instructors' feedback timely
4. Online mode impacts teachers' instructions	Utilize different teaching modes	Compared with in-person classes, instructors need to deal with different teaching modes
	Come across technical issues	Instructors face technical issues in online teaching
5. Lack of affective belonging in the online classes	Highlight the importance of visual	Visual plays an important role in social connections in the online class
	Feel isolated and alone online	Students feel lonely in online class

Comparisons of Synchronous and Asynchronous Discussions in an Online Roleplaying Simulation to Teach Middle School Written Argumentation Skills

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Abstract

In this study, different degrees of synchronous and asynchronous online social interactions are investigated in the context of an online educational roleplaying simulation game that is played across multiple classrooms simultaneously to teach argumentation skills and social studies. Results from 45 K–12 middle school social studies teachers and 867 students over 3 study conditions were compared based on the degree of real-time discussion that was embedded in each condition's version of game (i.e., two scheduled live conferences, one scheduled live conference, and asynchronous-only interactions or zero live conferences). All conditions exhibited significant small to moderate-level pre-post effect sizes, including the condition featuring asynchronous-only discussions. Additionally, the "mid-range" 1 live conference condition exhibited the greatest pre-post effect size in comparison to the other two conditions. This study demonstrates evidence for the benefits of implementing asynchronous-only discussions in digital interventions in comparison to live discussions when synchronous interaction may not be feasible. For designers, implementing both asynchronous and synchronous interactions based on available resources and feasibility can be used to maximize social presence among participants in educational roleplaying games and other virtual learning environments.

Keywords: asynchronous discussion; K–12 online learning; roleplaying simulation; argumentation instruction; social presence

For over 20 years, a central policy initiative for K–12 education has been the effort to promote student skills and interest within the STEM disciplines (Committee on STEM Education, 2018; NRC, 2014). Researchers and policymakers have repeatedly issued warnings of a great shortage of workers to meet STEM career openings and that working within the modern knowledge economy requires development in strong scientific and technological literacy skills that should begin as early as the elementary and middle grades (English, 2017; NRC, 2011, 2022; van den Hurk, Meelissen, & van Langen, 2018). To meet this need, governments, researchers, and policymakers worldwide have continually advocated for more STEM education offerings to engage students with socio-scientific content (Newcombe et al., 2009; Scogin et al., 2017). Specifically, these groups have called for teaching students not just the content of STEM disciplines, but also to develop essential cognitive skills for using content, such as critical thinking, problem-solving, and argumentation (Van Laar et al., 2017). Such skills are frequently cited as necessary for success in the STEM and knowledge-economy workforce where digital information is now ubiquitous, of varying quality, and from multiple perspectives (Noroozi, Dehghanzadeh, & Talee, 2020).

Among this call for critical STEM skills training within schools is the mastery of argumentation and the skills for evaluating and generating arguments to succeed in navigating the deluge of information that is encountered in everyday life (NRC, 2014). To this end, argumentation is often cited as an essential life skill for success during this age of information ubiquity (Bathgate et al., 2015; Kuhn, Hemberger, & Khait, 2016a; Özdem Yilmaz, Cakiroglu, Ertepinar, & Erduran, 2017). Additionally, it has been argued that the teaching of argumentation skills provides opportunities for robust learning experiences in any discipline and for any career, as argumentation establishes relevant active learning contexts for teaching subject content instead of teaching through rote memorization of facts and conceptual definitions, particularly in social studies (Cavagnetto, 2010; Iordanou, Kuhn, Matos, Shi, & Hemberger, 2019).

Research on the differences between asynchronous and synchronous social interactions is particularly important for providing insights toward the design of learning environments. This is especially the case in which the learning objectives are skills that are best developed in social situations like argumentation training, as it takes at least two people to hold an argument. Although asynchronous activities have always existed in K–12 through homework assignments, or, more recently, through out-of-class communications with teachers via media applications, the effects of asynchronous-only interactions in educational interventions that are deployed in K–12 schools are only recently becoming more regularly studied (Loncar, Barrett, & Liu, 2014; Lowenthal & Dunlap, 2020).

To contribute toward this literature, this study examined GlobalEd, an online educational roleplaying simulation game designed for middle school social studies classrooms. Originally designed to have both synchronous and asynchronous components for play among students across multiple classrooms, a recent edition of the game featured and investigated the effects of exclusively asynchronous-only discussions without any synchronous component. For this study, we evaluated whether an asynchronous-only condition was beneficial to students in comparison to versions of the game with synchronous discussions. Specifically, we experimentally investigated how two different live-discussion conditions compared to an asynchronous-only condition in terms of observed effects on students' argumentation skills. As argumentation is best learned in a social space that allows for regular dialogue between participants, the efficacy of an asynchronous-only design could dramatically increase the flexibility and design potential for social learning interventions.

Background

Argumentation as a Cross-disciplinary, Socially Learned Skill and Mechanism for Learning Disciplinary Content

Of the many skills that are necessary for scientists to be successful, mastery of argumentation and scientific reasoning are often cited as priorities for STEM instruction (Kuhn, Hemberger, & Khait, 2016b; McNeill, Lizotte, Krajcik, & Marx, 2006; Sandoval, Enyedy, Redman, & Xiao, 2019). Argumentation, as it is frequently used in the STEM disciplines, is more than just having disagreements with people (Andriessen, Baker, & Suthers, 2003). As the research on scientific argumentation and STEM career skills has grown over the last three decades, argumentation skills and the ability to critically analyze arguments have increasingly been cited as required critical skills within large-scale educational reforms and standards for socio-scientific literacy and competency within STEM disciplines, such as the Next Generation Science Standards (NGSS Lead States, 2013), the Common Core State Standards (CCSS, 2010), and the National Curriculum Standards for Social Studies (NCSS, 2010).

Indeed, the practical aspect of scientific communication of findings and persuasion through argumentation achieves a core function of the scientific process. However, additional benefits can also emerge when students are engaged with argumentation. Participants not only persuade others of their explanations, but they also engage in a collaborative and social process of understanding the content being argued (Coffin, Hewings, and North, 2012). Importantly, engaging with argumentation encourages students to confront, analyze, and refine their own understandings as well, such as that which has been demonstrated in the growing body of research that adopts the approach of *Arguing to Learn* (Andriessen, Baker, & Suthers, 2003; Bathgate et al., 2015). Within this approach, although students are simultaneously developing their argumentation skills, they have also been observed to develop critical thinking skills, writing skills, and the ability to learn content knowledge across domains as a direct result of engaging with argumentation processes (Kuhn, Hemberger, & Khait, 2016a; Suephatthima & Faikhamta, 2018). Additionally, because information is more readily available for retrieval at a moment's notice in today's digital landscape, it has even been suggested that the ability to interpret and analyze facts and concepts is perhaps more important than simply knowing these facts (Van Laar et al., 2017), a role for which argumentation training is well poised to support.

When learning skills like argumentation that are inherently grounded in social interaction and require the consideration of multiple perspectives, repeated practice within authentic social contexts is often seen as a necessary condition for learning such skills (Crowell & Kuhn, 2014; Iordanou et al., 2019). Otherwise, as argumentation is fundamentally a process that occurs between two or more people, any attempts at learning these skills without discussion or collaboration deprives learners of experiencing the authentic, situated contexts in which the skills are used (Noroozi et al., 2012). For instance, simply learning facts about argumentation or its structure does not sufficiently prepare students for engaging with actual argumentative tasks, as it lacks the opportunity to experience the transactive back-and-forth dialogue that underlies the process (Mercier, Boudry, Paglieri, & Trouche, 2016). Therefore, argumentation instruction is necessarily situated in social interaction: the practice of making and analyzing arguments always occurs between at least two people (Mercier et al., 2016; Scardamalia & Beriter, 2006). As a result, a consensus among argumentation scholars is that these skills are necessarily taught in socially rich environments in which participants regularly engage in dialogue with each other

and conduct argument analysis, construction, and feedback in a back-and-forth, transactive way (Henderson et al., 2018).

To this end, social processes such as argumentation require learning environments that enable social interaction to fully learn how to perform the skill. Especially in the post-pandemic educational environment, it has become increasingly important for researchers and instructional designers to create learning environments that can leverage the unique opportunities provided by digital technologies to enable authentic discussions and other social interactions, albeit at a distance. When people cannot be physically present together, synchronous and asynchronous online social discussions can be employed to provide spaces for socially intensive learning activities (Mercier et al., 2016; Noroozi et al., 2012).

Furthermore, online interactive approaches might afford unique conditions, opportunities, and motivations for learners that are not otherwise present in face-to-face learning contexts. In recent reviews, highly social online learning environments for teaching social skills such as argumentation have shown promising results; however, there has been virtually no research performed on the modality differences between face-to-face and various online, computer-mediated social interactive modalities for teaching argumentation (Asterhan & Schwarz, 2016; Lowenthal & Dunlap, 2020). The unique technological affordances for online socialization, including synchronous and asynchronous online discussions, should thus be further researched to maximize the potential for online learning in both K–12 and higher education (Henderson et al., 2018; Nussbaum, 2021).

Considering Simultaneity of Social Interaction and Social Presence for Online Learning Designs

The timing by which someone interacts in an online space may matter just as much as whether it is socially interactive in the first place. Knowing not just whether someone is expected to interact in a learning space, but also when someone is expected to interact are both primary components of the degree of "social presence" within an online Community of Learning (Garrison, 2016). The construct of social presence within a Community of Learning framework argues for the required presence of rich social interactions among learners in online learning environments. Opportunities for social interaction can activate the interpersonal and transactive processes that are essential for learning and meaning-making processes, such as discussing and determining the meaning of phenomena and concepts, debating concepts, and encountering other points of view to refine one's own understanding (Kozan & Richardson, 2014). Toward this focus on social presence, it has been regularly observed that the expectation of the degree and timing of which participants will interact will often influence variations in the type of behaviors that are exhibited in learning environments (Chen, Park, & Hand, 2016; Coffin, Hewings, & North, 2012; Koehler et al., 2020).

Varied expectations by the learner of the timing and simultaneity of responsiveness from peers in the social setting may determine the types of responses, depth of thinking, and included content associated with a given learner's participation (Cui, Lockee, & Meng, 2012; Foo & Quek, 2019; Larrain, Freire, Lopez, & Grau, 2019; Peterson, Beymer, & Putnam, 2018). Additionally, technology-based supports and scaffolding may be more readily implemented in asynchronous online activities than those requiring more real-time adaptations and assistance (Jeong & Joung, 2007; Jeong & Fraiser, 2008; Lin, Hong, & Lawrenz, 2012). Furthermore, although the inclusion of real-time interactions might create a more immersive and engaging environment that requires the participant to be cognitively attentive, such real-time expectations

could demand more of the learner's attention, as well as be taxing on teachers who face various classroom and scheduling constraints when implementing live, synchronous interventions (Cui, Lockee, & Meng, 2012; Nieuwoudt, 2020).

It has become increasingly necessary given the post-pandemic educational landscape to investigate the effects and mechanisms connected to different levels of social presence within online learning environments that rely on social interactions. Although live social interactions in an online intervention have regularly been assumed to yield better results, such interactions may not always be feasible for a teacher to implement. This is especially true in situations where students may be having discussions or otherwise collaborating with people outside of a physical classroom. Various classroom constraints are typically present and teachers often need flexible options, or at least options for students to engage with environments outside of their scheduled classroom time or in a virtual manner.

Online Educational Simulation Games (ESGs) and Roleplaying: Enabling Flexible Implementation of both Synchronous and Asynchronous Discussions

The use of educational simulation games (ESGs) and interactive roleplaying is one approach that is well-suited to provide rich contexts for social interactions and exposure to social studies concepts in an authentic way (Devlin-Scherer & Sardone, 2010; Liu, Cheng, & Huang, 2011). The use of simulations as educational interventions is certainly not new, but advances in digital technologies over the last two decades have enabled the virtualization of both physical and social processes in ways never possible before. ESGs and roleplaying games that specifically model *social processes* (Gredler, 2013) can allow players to interact with social forces and assume the role of actors within the system through authentic roleplaying. In such games, players are assigned roles with specific goals within a simulated social event or system that models real-world social phenomena (Sauve et al., 2007). When a social simulation is additionally integrated with game mechanics, players, as agents in the game, gain clear goals on how to *win* the game, a set of rules for interactions and allowed player "moves" in the game, and feedback mechanisms (e.g., points, penalties) to guide their play and improve motivation (Brom, Stárková, Bromová, & Děchtěrenko, 2019; Vlachopoulos & Makri, 2017). Thus, authentic roleplaying in this manner allows for deep and authentic investigation of the forces and concepts under study within the game and to foster opportunities for social interaction to grapple with skills that are socially learned, like argumentation (Squazzoni et al., 2014).

Although modern ESGs and roleplaying games that model social processes can be played both in-person and online, online games are particularly timely for social studies education in today's post-pandemic world due to their ability to provide uninterrupted continuation of gameplay both inside and outside of the classroom. As seen from the widespread school closures as a result of the global COVID-19 pandemic, effective online interventions that facilitate ongoing interactions among students and teachers can be valuable in the situation of school closures or student absences from school. As they are educational interventions that can enable motivating synchronous and asynchronous modes of social interactivity, ESGs are well-poised to permit continuous dialogue and collaboration among students in their own class based on the teacher's pedagogical needs.

The Present Study: Observing Effects of Variations in Simultaneity in the GlobalEd Game

Studies have been performed recently between the varying degrees of simultaneity in online social interactions in K–12 learning environments, generally showing that both

synchronous and asynchronous interactions, such as online written discussions, among participants have shown benefits based on the intended learning goals for which they were implemented (Gašević et al., 2015; Lowenthal, Dunlap, & Snelson, 2017; Yamagata-Lynch, 2014). Fewer studies, however, have been performed comparing the varying types, levels, and benefits of asynchronous-only and live, real-time discussions specifically in the context of online roleplaying and social simulations and how they can foster student achievement.

This study reports an experiment on multiple designs of GlobalEd, an online educational roleplaying simulation game for middle school social studies classrooms. GlobalEd simulates a social process of a complex international crisis in which students play the roles of different countries that come together to research and develop proposals to solve a given real-world problem scenario (Lawless et al., 2018; Riel & Lawless, 2022). Through gameplay, social interactions like discussion are a fundamental principle to the design of GlobalEd as a pedagogical approach for developing students' argumentation skills (Mercier, Boudry, Paglieri, & Trouche, 2016; Scardamalia & Beriter, 2006).

Specifically, because previous iterations of the GlobalEd game over its ten-year history had always included a synchronous discussion opportunity to online players, we were particularly interested if the game could be played in an asynchronous-only way and still generate an observable effect on the argumentation skills learning outcome. We wanted to investigate if increasing levels of simultaneity or synchronous play had a positively trending effect in comparison to asynchronous play. This would help test an assumption of whether including the most or highest-level live discussion is the best option in online and socially intensive learning interventions, such as social simulations or roleplaying games.

The following two research questions guided this study to respond to the need for additional research on comparing the differences in the effects on learning outcomes between synchronous and asynchronous discussions in online simulations and games that prioritize social interaction for learning:

RQ1: Does an asynchronous-only version of the GlobalEd intervention demonstrate either comparable or higher effects in written argumentation skills (i.e., the primary learning objective of GlobalEd) than two other versions of GlobalEd that emphasize synchronous discussions among players?

RQ2: Do increased levels of synchronous discussions in GlobalEd demonstrate progressively higher effects in written argumentation skills (i.e., the primary learning objective of GlobalEd).

Context for the Study—Description of the Intervention

## The GlobalEd Online Roleplaying Simulation

The intervention in this study is an online roleplaying simulation called GlobalEd. GlobalEd is designed for play across multiple social studies classrooms simultaneously to simulate complex international social interactions and systems in an authentic way (Lawless et al., 2018; Riel & Lawless, 2022). This allows for players to discover and apply real-world knowledge related to socio-scientific issues that do not often have a "correct answer" solution. Such ill-defined challenges mirror the authentic problems that scientists, technologists, diplomatic professionals, and policymakers face with solving authentic global issues.

In the game, students play the roles of scientific advisors to an assigned country. Each country that is roleplayed by students in the game is invited to an international summit (represented by synchronous or asynchronous discussions) to solve an assigned problem scenario. Up to 20 countries (i.e., different classrooms) play in a single GlobalEd game.

Interactive Discussions within GlobalEd

Play of GlobalEd progresses over three phases during a multi-week period: an initial research phase, an interactive discussion phase, and a summary debriefing phase. The primary goal of play is for each team to develop a single final proposal that has been co-sponsored by at least two other country teams (i.e., other classrooms). When the final proposals are submitted, they are voted upon by all teams, with the winner of the game being the one who has received the most votes.The essential feature of GlobalEd is the dialogue that is generated by students during both asynchronous messaging and live synchronous conferences across teams. In the first type of dialogue, players solve the assigned problem scenario via live, real-time conferences between classroom teams in collaboration on solutions to the problem scenario. The live conferences take place within a synchronous, instant-messaging-like online communications system where all players meet at a scheduled time. Before each live conference, students are provided with an agenda of the topics that will be discussed, which allows the students to prepare their ideas, solutions, and evidence to submit to the other teams for consideration. All student dialogue is moderated by a trained coordinator for both appropriate content, for prompting students to maintain their assigned roles in the game, and for coaching students in the use of argumentation skills. An example screenshot from a live conference is provided in Figure 1.

Figure 1
Screenshot from conference
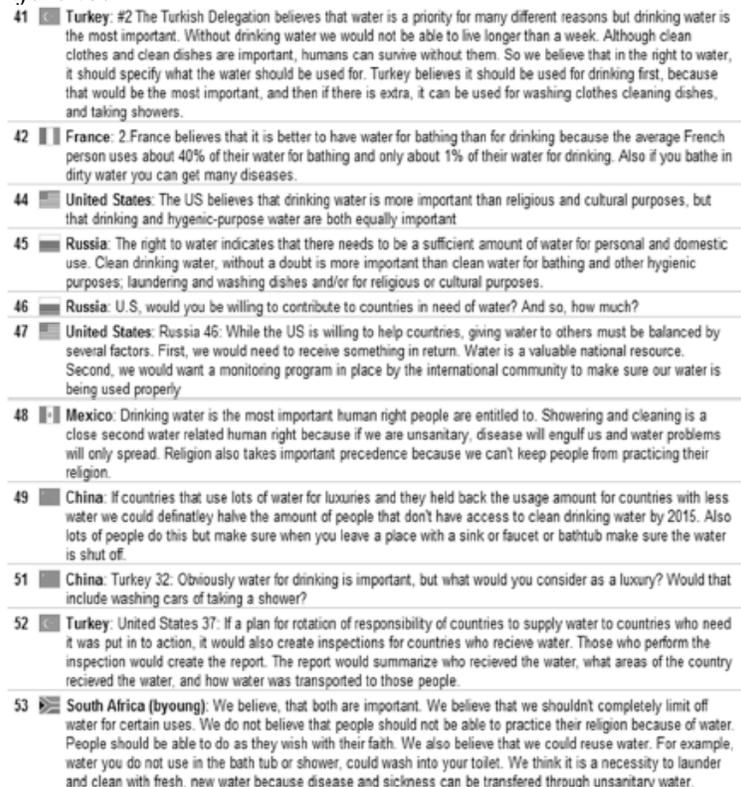
In the second form of dialogue, students also interact with each other via asynchronous messaging (i.e., email-like messages) throughout the entire duration of the game. In asynchronous messages, players negotiate their positions and perform collaborative research over the full duration of the interactive phase. The asynchronous messaging is performed in an email-like interface with which students can log on at any time, including outside-of-classroom time or at home. An example asynchronous message and reply between two country teams from the actual game environment is illustrated in Figure 2.

Figure 2
Screenshot of asynchronous messaging between teams in actual GlobalEd play

Msg 518 | Date: Nov 9, 2017 09:30 EST
From: Saudi Arabia
To: Brazil
Issue: Economics
Subject: Proposal

Dear Brazilian delegates,

Saudi Arabia has noticed that Australia is the third biggest producer of beef. We also buy a lot of beef from you guys. We feel we are taking away freshwater from you. Saudi Arabia has a proposal for you. Saudi Arabia will reduce how much beef we buy from Australia, so then Saudi Arabia saves money. Then Brazil will save water in return. Please let us know your decision as soon as possible.

Sincerely,
The Saudi Arabian Delegation

REPLY to Msg 518
Msg 623 | Date: Nov 14, 2017 14:42 EST
From: Brazil | To: Saudi Arabia | Issue: Economics
Subject: RE: Proposal

Greetings Saudi Arabia Economic Team,

We realize that you are concerned with saving money and you have decided that the best way to save money is to cut the beef trade with Brazil. This may save money for your country and this money could be used for spending on solutions aimed at solving the water crisis. Although cutting the beef trade with Brazil will lead to extreme shortages of food in your country. This will obviously cause much of your population to starve and could possibly lead to more money being spent to feed these starving populations than would be saved by cutting beef. For the sake of both of our countries, we highly advise you against stopping the beef trade with our country. We suggest that your country looks for other solutions to the water crisis.

Sincerely,
The Brazil Economic Team

Through the asynchronous messages, players continue the conversation and to debate issues with teams as they work toward developing well-argued proposals that will gain co-sponsorships and alliances with other teams. Both the asynchronous and synchronous messaging discussions in the simulated international summit are facilitated in an online communications platform that moderates all communications between players, hosts scheduled events, and promotes interaction among players. Within both types of discussions, players regularly are encouraged to challenge each other to strengthen their arguments, to provide more evidence about their claims, or to provide additional context for the solutions that they are proposing.

GlobalEd has been in continual development and iteration over the last 10 years and has repeatedly demonstrated high levels of efficacy in development of student argumentation skills, content knowledge, and interest and self-efficacy in social studies and science topics and careers (Lawless et al., 2018, 2019; Yukhymenko, 2011). However, live synchronous discussions have been the highlight for each iteration of the game for the past ten years. For this study, we attempted a game version that only used asynchronous communications for player discussion, with no live synchronous discussions. Additionally, we also wanted to identify if more live discussion opportunities had a stronger effect than the asynchronous-only alternative.

Methods

Participants

In the present study, 45 middle school social studies teachers in the United States participated, along with the students (n = 867) in each of their classrooms. Teachers each played a version of the GlobalEd game with their students based on the condition to which they were assigned. The simulation's program, content, and structure among conditions were identical except for the number of scheduled real-time, live conferences in which students would participate. Table 1 provides a breakdown of participants (students and teachers) by condition.

Teachers from different schools in both suburban and urban classrooms were randomly divided into one of three study conditions, which represent the level of live, real-time synchronous discussions (i.e., live conferences) that their assigned simulation would have: two scheduled live conferences (*n* = 17 teachers, 341 students), one scheduled live conference (*n* = 13 teachers, 263 students), and no scheduled live conferences or asynchronous-only discussions (*n* = 15 teachers, 260 students). Table 1 provides a breakdown on participant totals by condition.

Table 1
Number of Participants by Condition

	0 Live Conferences–Asynchronous	1 Live Conference	2 Live Conferences
Teachers	15	13	17
Students	260	263	341

Data and Instruments

Students were presented with identical pre- and post-intervention essay assignments to demonstrate their skill with written argumentation and to exercise their knowledge of the social studies concepts they encountered. In this assignment, students were presented with a prompt related to the simulation that they were tasked with writing about. The text used in the essay assignment for both the pre- and post-instruments is featured in Figure 5.

Figure 5
Pre- and post-essay assignment

ESSAY WRITING ASSIGNMENT

Prompt

The world is in danger of running out of fresh water. Do you think this is true? Do you agree or disagree with this statement? Why?

Assignment

Write a persuasive essay stating your point of view on the prompt above. Give evidence to support your answer and provide your reasoning why this evidence supports your claim. Use your knowledge about water, science, world geography and cultures to help you write your response. You will have a total of 30 minutes to complete your essay.

The assigned problem scenario for all students in each of the three conditions was a global water scarcity dilemma to solve collaboratively with other teams, so it was expected that students would improve in the post assessment in both content knowledge of social studies as well as their written argumentation skills in response to the assessment prompt. We intentionally used instruments that captured students' writing as they made and defended a claim, as the instrument specifically prompted students to demonstrate their skill in complex thinking and argumentation. Thus, direct evidence of students' written argumentation skills and content knowledge were captured with a high degree of resolution for identifying the connections between the content knowledge and use of argumentation (Albanese, 2000; Savin-Baden, 2004).

The research team developed a rubric before implementation to analyze the pre- and post-essay writing instruments. This rubric measured the level of argumentation skills on multiple parameters, including the presence and quality of students' use of claim, evidence, reasoning, and addressing the opposition, as well as to capture evidence of the use of social studies concepts that students encountered during the game. The rubric scored essays on seven items related to argumentation skills, with the post-coding values for each item being combined into a single summative scale value for each the pre- and post-essay.

Each essay was scored by three graduate-level students who were trained on the rubric and had 100% interrater agreement on a test set of essays after conference. After completing the test set, each coder graded each essay, pre and post. Because the instruments were identical, the pre and post versions of the essays were blinded to the coders as to reveal whether it was a pre or post during scoring. Although each of the three coders coded each essay, for data imputation purposes each essay was randomly assigned by computer to two of the coders. Each item was analyzed for alignment by computer between the coders. Any disagreements within 1 point between the two coders on the spreadsheet were resolved by adding the third coder's score and

taking the mean, averaging to the nearest half-point. No additional coding disagreements emerged after a third coder was introduced. Coding reliability between raters was > 0.80. Table 2 presents the scoring parameters in the rubric that were used for coding the identical pre- and post-essays.

Table 2
Essay Grading Scoring Parameters for the Identical Pre- and Post-Writing Assignments

Item	Possible Score
Claim	Up to 2, based on clarity of claim
Evidence	Up to 3, based on quality and amount of evidence
Reasoning	Up to 2, based on level of connection between claim and evidence
Addressing the Opposition	Up to 2, based on including opposition points and presence of a counterclaim
Organization	Up to 2, based on quality of organization and neatness of the essay
Science Content	Up to 3, based on frequency of distinct science concepts discussed
Social Studies Content	Up to 3, based on frequency of distinct social studies concepts discussed
Total Possible Points	**17** (combined as a summative scale)

Data Analysis

We conducted a hierarchical linear modeling (HLM) analysis (mixed) with the pre- and post-essay writing scores to compare the three conditions of the study and account for pre-test skills exhibited by students, as well as any classroom- or teacher-level effects that might be observed. HLM is a type of mixed-level multiple regression analysis that accounts for multiple "nested" levels of data and potential effects on the dependent variable that could occur at the different levels. HLM uses maximum-likelihood estimation to estimate the coefficients for each fixed effect that is entered into the model as the model predicts the output dependent variable.

HLM is increasingly used in educational research due to its robustness to detect classroom- or teacher-level effects among student achievement and other outcome variables (Raudenbush & Bryk, 2002). HLM is well-suited for education research as its models account for the moderating effects of teachers or even schools that are within different hierarchical levels (i.e., students within classrooms within schools). Furthermore, like ordinary multiple regression, HLM can account for other independent mediating or moderating factors within the analysis as fixed effects or random effects.

We employed the HLM 7 software suite (Raudenbush, Bryk, Cheong, Congdon, & du Toit, 2011) to conduct the analysis. Due to the naturally stratified nature of educational research data originating from multiple authentic classroom sites, student participants (at level 1—L1) were nested in the HLM model within teacher classrooms (at level 2—L2). In this multilevel analysis, a nested structure allows for the researchers to account for any possible teacher effects via inclusion of the pretest of students' writing performance at L2 centered around the grand mean to account for students' skill level at the outset of the intervention and their growth over time (Raudenbush & Bryk, 2002). A third nested level (L3) that represents the schools in which classrooms are nested was not necessary in this analysis, as there were no school-level effects to

observe with multiple classrooms within single schools participating in the study. Different schools participated in the analysis.

The three experimental conditions were each coded as binary variables (0/1) that represented whether a student participated a given condition. In the model, the conditions of "2 live conferences" and "1 live conference" were entered as fixed effects in the conditional model. The binary coding scheme for each condition's variable assigned a value of 1 if a student was a part of the condition, or 0 if not. Thus, if a student was in the 1 live conference condition, the variable would be value = 1, otherwise it would be 0. The condition of "0 live conferences— asynchronous only" represented the baseline comparison for the model and was therefore not entered as a fixed effects term. The 0-conference condition is instead represented in the model's intercepts (i.e., when the "1 live conference" and "2 live conference" conditions are both value = 0). These comparison conditions were entered at L2 to represent each classroom's experimental condition to which they were randomly assigned.

Additionally, students' pre-scores on the essay instrument were entered as an L1 fixed effect that was centered around the group mean at L1 to account for students' prior knowledge and skills with the instrument and to identify the degree of pre and post student gains. Group-mean centering at this level is appropriate due to the potential classroom-level effects that might be observed within each classroom group. Furthermore, teacher- or classroom-level effects were also accounted for in the model, which was represented by students' pre-test scores centered around the grand mean at L2 to consider pre-scores between groups.

The results from the HLM analyses were then used to determine the effect size of each condition. The HLM equation for this study is provided in Equation 1.

Equation 1
Expanded 2-Level Equation for Hierarchical Linear Model Analysis

$$\text{Post-achievement } (\underline{Y}) = g_{00} + g_{01}*1\text{Conf} + g_{02}*2\text{Conf} + g_{03}*\text{TC\_achievement} + g_{10} *\text{SC\_achievement} + u_0 + u_1 + r$$

In the model, $\underline{Y}$ represents the dependent variable for student achievement, as measured by student written argumentation scores on the post-essay instrument. The fixed effects terms for the experimental conditions are 2Conf (2 live conferences) and 1Conf (1 live conference), which were binary terms that indicated participation in the particular condition or not. The 0 live conference condition is represented in the model as the baseline measure through the intercept g_{00} when both 2Conf and 1Conf are value = 0. TC_achievement represents the level-2 teacher-centered grand-mean value for the pre-essay instrument to account for teacher-level classroom effects, SC_achievement represents the student-centered group-mean value for the pre-essay instrument, and u_0, u_1, and r collectively are random effects terms in the model.

Results

Table 3 displays the descriptive statistics on essay writing scores (as a summative scale score of the seven items on the essay rubric) for all conditions.

Table 3
Descriptive Statistics

Condition	*n*	Pre-Writing Mean	Pre-Writing Std. Dev.	Post-Writing Mean	Post-Writing Std. Dev.
Full Study					
0 Live Conf.	260	5.59	1.81	6.47	1.96
1 Live Conf.	263	5.00	1.87	5.97	2.04
2 Live Conf.	341	4.45	2.26	5.26	2.72

Table 4 displays the results of the HLM analysis. The fixed effects of 1-conference and 2-conference are in comparison to the 0-conference condition, which is represented as the baseline in the model. Comparatively, the 1-conference condition yielded higher positive results in comparison to the 0-conference condition, as indicated by a positive coefficient estimate. Because of its negative coefficient, the 2-conference condition fixed effect demonstrated that the 0-conference asynchronous condition outperformed the 2-live conference condition.

Table 4
HLM Analysis Results: Model Statistics

Fixed Effects	*Estimates*	*Std. Error*
Intercept	*5.797***	*0.180*
1 conference	0.692*	0.361
2-conference	-1.058**	0.461
Student Pre-Writing	0.301**	0.102
L2 Teacher-level pre-writing means	0.311**	0.048

*p = .062; **p < 0.05

It is important to take care with interpreting the 1-to-0 conference comparison (i.e., the 1-conference term), as it was observed at p = .062 and thus the observed differences may be due to chance. Although the comparison between 0 conference (asynchronous) and 1 conference closely approached significance at the p < .05 threshold commonly accepted in social science research, there could also be no difference between the two, or instead interpreted as roughly equal groups.

Additionally, through the inclusion of the pre-writing assessment at both L1 (student) and L2 (teacher), the model also accounts for students' skills prior to starting the intervention. A significant L2 teacher-level pre-writing assessment term indicates that there were classroom-

level effects observed and that students performed differently between collective classrooms. The HLM model accounts for these potential effects in calculating the overall estimates of the coefficients and their relationships to the dependent variable of written argumentation achievement.

Table 5 further interprets differences between the comparison conditions by providing pre-post effect sizes for each condition (reported as Cohen's *d*) to compare which condition had the highest pre-post effects across the study. For each condition, pre-post effect size was calculated as the difference between the means between the pre- and the post-tests divided by the pooled standard deviation of the condition. The comparison of pre-post effect sizes, otherwise known as a standardized difference of means, is appropriate in situations where identical instrumentation is used in educational pre-post assessment and effect sizes are thus interpretable in a standardized, comparable way (Morris, 2008). Each of the three conditions were confirmed to have been effective as intended, as each condition demonstrated significant positive mean differences favoring the post-test within confirmatory paired-samples t-tests ($p < .001$ for all). This indicated that within each condition, the students performed better in the post- than the pre-assessment, Subsequently, this can be interpreted as having demonstrated learning and growth (or, alternatively, that the intervention achieved its learning objective goals).

Table 5
Pre-Post Effect Size Results for Synchronous and Asynchronous Interaction Conditions

0-Conference Condition (Completely Asynchronous)	1-Conference Condition	2-Conference Condition
0.466	0.496	0.324

Note. Pre-post differences in means for each condition were confirmed by paired-samples t-tests, all of which were observed to be $p < .001$. Effect sizes reported as Cohen's *d*.

In Table 5, the 1-Conference condition was observed to yield superior pre-post student achievement effects in comparison to the other two conditions. The 2-Conferences and No-Conference also demonstrated effects in the HLM model and were confirmed by paired-samples t-tests, but to a lesser degree than the 1-Conference condition. These results indicate evidence for the efficacy of the intervention regardless of condition. In a conventional interpretation effect size, each condition can be seen as having a small to moderate effect (0.3–0.5) on student achievement. Indeed, the 1-conference condition yielded the highest effect, but the 2-conference and asynchronous-only 0-conference conditions both also yielded effects that trend toward moderate levels.

Because the difference between 0 and 1 live conference was not observed to be significant at the $p < .05$ threshold generally accepted by the education field, these two effects are relatively the same. Although the difference was not significant in the HLM model, this study does suggest that some degree of combined live discussion and asynchronous-only discussion might provide a boost to student learning outcomes in comparison to asynchronous-only discussion, especially when the learning outcomes are highly social in nature (such as from learning argumentation skills).

Also of note is the significant negative difference between the 0-conference condition and the 2-conference condition in the HLM model, providing evidence that higher levels of live discussions may not always be the best option in virtual learning environments in comparison to

providing asynchronous-only discussions. This observation is corroborated by observing a lower effect size between the 2-conference and 0-conference conditions, with 0-conference demonstrating a higher effect size.

Conclusion

Each condition in the study yielded a moderate effect size, providing evidence for flexibility in how designers develop socially intensive online spaces and for teachers in the degree to which they choose to engage with online social activity for their students synchronously. For this study, it was useful to identify evidence for designers that when course time is limited, an asynchronous-only condition can still be feasible and yielded a moderate effect in the achievement of learning outcomes. In many cases in the post-pandemic landscape, virtual asynchronous social interactions may be a teacher's best or *only* option. In this study, the asynchronous-only condition of the GlobalEd intervention was demonstrated to be effective.

More study and theorization on this concept are certainly needed to understand how and why the higher degree of live discussion was observed to have a lesser effect than the mid-range live-discussion condition and the asynchronous-only condition. In terms of social presence, live interactions are thought of to be a "richer" learning experience but may not always be necessary to indicate the presence of other individuals and groups (Chen, Park, & Hand, 2016; Garrison, 2016; Koehler et al., 2020). In today's digital ecosystem, a high degree of live discussions may serve to be distracting for some individuals or demand a high level of cognitive load, which may actually counter the benefits of the learning activity. Live interactions, particularly over time, might be mentally taxing to some learners but invigorating to others (Cui, Lockee, & Meng, 2012; Nieuwoudt, 2020).

Additionally, in virtual discussion, social presence also is dictated by the level of *expectation* of a person's behavior in the learning experience, as well as how the learning environment facilitates both asynchronous and synchronous discussion (Chen, Park, & Hand, 2016; Coffin, Hewings, & North, 2012). As such, the expectations of learners' social presence when interacting in a virtual space may be different than the expectations of the instructional designers and game developers who design activities and interactions for play (Cui, Lockee, & Meng, 2012; Larrain et al., 2019).

If real-time interaction and synchronous social presence are deemed the most desirable in online and hybrid learning environments, further study should be pursued in virtual learning contexts to investigate if and why students might perform better with only some but not the highest number of real-time interactions possible.

However, with the evidence from this study, it is heartening for instructional designers and teachers alike that any level of social interaction chosen still elicited the desired learning outcomes. Additional studies on the level of simultaneity of effective virtual interventions should be conducted to investigate whether asynchronous-only, mixed, or high-synchronous discussions all work effectively at achieving learning objectives, as to give educators increased choice in the implementation of virtual learning products with varying levels of required social presence. This is particularly important in the post-pandemic landscape where teachers may need to move rapidly from a synchronous learning context to an asynchronous-only context. Research on the efficacy of innovations tested with varying levels of simultaneity will help decision makers with selecting robust curricular materials.

This study is limited in scope related to asynchronous and synchronous learning conditions as it investigated just one single roleplaying game, one context in which discussions

occurred by students, and one set of learning objectives. Additionally, the intervention is a simulation roleplaying game and not another type of online learning activity, preventing too broad of claims about simultaneity of discussion. Despite these classic limitations that are common in educational research, what has been demonstrated is that there was value to the asynchronous-only version of play as it yielded a beneficial effect. Additionally, the most live discussions were not found to be the condition to have the highest impact. Primary research like this study that richly describes the intervention design and evaluates the effectiveness of single intervention designs are necessary for teachers, policymakers, and instructional designers to make sound decisions on development and implementation of interventions.

In our reflection as instructional designers and researchers of the GlobalEd project after over ten years of implementation of the GlobalEd game in hundreds of classrooms, one of teachers' biggest hurdles was the scheduling of live discussions during constrained curricular time. Within the classroom, teachers have only limited time to get students to interact together, especially if working in small groups. Additionally, GlobalEd players are afforded the opportunity to interact across classrooms through extended play. Thus, the GlobalEd roleplaying game enables two layers of discussions, both of which are enabled through asynchronous interactions that can be performed outside of class through homework, small group work, or even remote learning at home. The results of a substantial effect size for the asynchronous-only condition confirmed for us the value in providing teachers flexibility in the play and implementation of GlobalEd. When designed in a principled way, asynchronous discussions can still promote social presence among participants, including those in the K–12 age range. However, this study also highlights the importance of evaluating whether designs work as intended and if learning objectives are met, otherwise designers risk the intervention yielding no effect and possibly a disappointing social experience for participants.

In the post-pandemic educational landscape where shifts to virtual learning can happen in an instant, online learning activities such as games and simulations that model social processes can continue to foster inquiry and development of key social studies skills without any interruption. Online games and simulations can be played in face-to-face classrooms, when possible, but also can allow for the virtual game platform to facilitate and organize high-impact play discussion regardless of whether the game is played in the classroom or online, or whether it is played synchronously or asynchronously.

Declarations
The authors report no conflicts of interest related to the conduct and publication of this study.

This study involved human subjects was conducted under research protocols approved by the institutional review boards of the University of Illinois at Chicago and the University of Connecticut.

References

Andriessen, J., Baker, M., & Suthers, D. (2003). Argumentation, computer support, and the educational context of confronting cognitions. In J. Andriessen, M. Baker, & D. Suthers (Eds.), *Arguing to learn* (pp. 1–25). Springer.

Applebee, A. N., & Langer, J. A. (2006). *The state of writing instruction in America's schools: What existing data tell us*. Center on English Learning and Achievement.

Asterhan, C. S., & Schwarz, B. B. (2016). Argumentation for learning: Well-trodden paths and unexplored territories. *Educational Psychologist, 51*(2), 164–187.

Bathgate, M., Crowell, A., Schunn, C., Cannady, M., & Dorph, R. (2015). The learning benefits of being willing and able to engage in scientific argumentation. *International Journal of Science Education, 37*(10), 1590–1612.

Brom, C., Stárková, T., Bromová, E., & Děchtěrenko, F. (2019). Gamifying a simulation: Do a game goal, choice, points, and praise enhance learning? *Journal of Educational Computing Research, 57*(6), 1575–1613.

Cavagnetto, A. R. (2010). Argument to foster scientific literacy: A review of argument interventions in K–12 science contexts. *Review of Educational Research, 80*(3), 336–371.

CCSS: Common Core State Standards. (2010). *Common Core State Standards for English language arts & literacy in history/social studies, science, and technical subjects.* Common Core State Standards Initiative.

Chen, Y. C., Park, S., & Hand, B. (2016). Examining the use of talk and writing for students' development of scientific conceptual knowledge through constructing and critiquing arguments. *Cognition and Instruction, 34*(2), 100–147.

Chinn, C. A., & Malhotra, B.A (2002). Epistemologically authentic inquiry in schools: A theoretical framework for evaluating inquiry tasks. *Science Education, 86*(2), 175–218.

Coffin, C., Hewings, A., & North, S. (2012). Arguing as an academic purpose: The role of asynchronous conferencing in supporting argumentative dialogue in school and university. *Journal of English for Academic Purposes, 11*(1), 38–51.

Committee on STEM Education (CoSTEM) of the National Science & Technology Council. (2018). *Charting a course for success: America's Strategy for STEM Education.* National Science & Technology Council.

Crowell, A., & Kuhn, D. (2014). Developing dialogic argumentation skills: A 3-year intervention study. Journal of *Cognition and Development, 15*(2), 363–381.

Cui, G., Lockee, B., & Meng, C. (2013). Building modern online social presence: A review of social presence theory and its instructional design implications for future trends. *Education and Information Technologies, 18*(4), 661–685.

Darabi, A., Arrastia, M. C., Nelson, D. W., Cornille, T., & Liang, X. (2011). Cognitive presence in asynchronous online learning: A comparison of four discussion strategies. *Journal of Computer Assisted Learning, 27*(3), 216–227.

Devlin-Scherer, R., & Sardone, N. B. (2010). Digital simulation games for social studies classrooms. *The Clearing House, 83*(4), 138–144.

English, L. D. (2017). Advancing elementary and middle school STEM education. *International Journal of Science and Mathematics Education, 15,* 5–24.

Foo, S. Y., & Quek, C. L. (2019). Developing Students' Critical Thinking through Asynchronous Online Discussions: A Literature Review. *Malaysian Online Journal of Educational Technology, 7*(2), 37–58.

Garrison, D. R. (2016). *E-Learning in the 21st Century: A Community of Inquiry framework for research and practice* (3rd ed.). Routledge.

Gašević, D., Adesope, O., Joksimović, S., & Kovanović, V. (2015). Externally-facilitated regulation scaffolding and role assignment to develop cognitive presence in asynchronous online discussions. *The Internet and Higher Education, 24*, 53–65.

Gredler, M. E. (2013). Games and simulations and their relationships to learning. In D. Jonassen & M. Driscoll (Eds.), *Handbook of Research on Educational Communications and Technology* (2nd ed., pp. 571–581). Routledge.

Hammond, M. (2005). A review of recent papers on online discussion in teaching and learning in higher education. *Journal of Asynchronous Learning Networks*, *9*(3), 9–23.

Henderson, J. B., McNeill, K. L., González-Howard, M., Close, K., & Evans, M. (2018). Key challenges and future directions for educational research on scientific argumentation. *Journal of Research in Science Teaching, 55*(1), 5–18.

Iordanou, K., Kuhn, D., Matos, F., Shi, Y., & Hemberger, L. (2019). Learning by arguing. *Learning and Instruction, 63*, 101207.

Jeong, A., & Frazier, S. (2008). How day of posting affects level of critical discourse in asynchronous discussions and computer-supported collaborative argumentation. *British Journal of Educational Technology, 39*(5), 875–887.

Jeong, A., & Joung, S. (2007). Scaffolding collaborative argumentation in asynchronous discussions with message constraints and message labels. *Computers & Education, 48*(3), 427–445.

Kanuka, H., & Garrison, D. R. (2004). Cognitive presence in online learning. *Journal of Computing in Higher Education, 15*(2), 21.

Koehler, A. A., Fiock, H., Janakiraman, S., Cheng, Z., & Wang, H. (2020). Asynchronous online discussions during case-based learning: A problem-solving process. *Online Learning Journal, 24*(4), 64–92.

Kozan, K., & Richardson, J. C. (2014). Interrelationships between and among social, teaching, and cognitive presence. *The Internet and Higher Education, 21*, 68–73.

Kuhn, D., Hemberger, L., & Khait, V. (2016a). Tracing the development of argumentative writing in a discourse-rich context. *Written Communication, 33*(1), 92–121.

Kuhn, D., Hemberger, L., & Khait, V. (2016b). *Argue with me: Argument as a path to developing students' thinking and writing*. Routledge.

Larrain, A., Freire, P., López, P., & Grau, V. (2019). Counter-arguing during curriculum-supported peer interaction facilitates middle-school students' science content knowledge. *Cognition and Instruction, 37*(4), 453–482.

Lawless, K. A., Brown, S. W., Rhoads, C. H., Lynn, L. J., Newton, S. D., Brodowinska, K., Oren, J., Riel, J., Song, S., & Wang, M. (2018). Promoting students science literacy skills through a simulation of international negotiations. *Computers in Human Behavior, 78*, 389–396.

Lawless, K. A., Brown, S. W., Lynn, L. L., Riel, J., Brucianelli, K. B., & Oren, J. B. (2019, April). *Efficacy of a socioscientific simulation on students' written argumentation* [Conference presentation] 2019 American Educational Research Association Annual Meeting, Toronto, Ontario, Canada.

Lin, H. S., Hong, Z. R., & Lawrenz, F. (2012). Promoting and scaffolding argumentation through reflective asynchronous discussions. *Computers & Education, 59*(2), 378–384.

Liu, C. C., Cheng, Y. B., & Huang, C. W. (2011). The effect of simulation games on the learning of computational problem solving. *Computers & Education, 57*(3), 1907–1918.

Loncar, M., Barrett, N. E., & Liu, G. Z. (2014). Towards the refinement of forum and asynchronous online discussion in educational contexts worldwide: Trends and investigative approaches within a dominant research paradigm. *Computers & Education, 73*, 93–110.

Lowenthal, P. R., & Dunlap, J. C. (2020). Social presence and online discussions: A mixed method investigation. *Distance Education, 41*(4), 490–514.

McNeill, K. L., Lizotte, D. J., Krajcik, J., & Marx, R. W. (2006). Supporting students' construction of scientific explanations by fading scaffolds in instructional materials. *The Journal of the Learning Sciences, 15*(2), 153–191.

Mercier, H., Boudry, M., Paglieri, F., & Trouche, E. (2017). Natural-born arguers: Teaching how to make the best of our reasoning abilities. *Educational Psychologist, 52*(1), 1–16.

Milner IV, H. R. (2014). Culturally relevant, purpose-driven learning & teaching in a middle school social studies classroom. *Multicultural Education, 21*(2), 9–17.

NCSS: National Council for the Social Studies (2010). *National curriculum standards for the social studies*: *A framework for teaching, learning, and assessment.* NCSS.

Newcombe, N. S., Ambady, N., Eccles, J., Gomez, L., Klahr, D., Linn, M., ... & Mix, K. (2009). Psychology's role in mathematics and science education. *American Psychologist, 64*(6), 538.

Nieuwoudt, J. E. (2020). Investigating synchronous and asynchronous class attendance as predictors of academic success in online education. *Australasian Journal of Educational Technology, 36*(3), 15–25.

NGSS Lead States. (2013). *Next generation science standards: For states, by states.* National Academies Press.

Noroozi, O., Dehghanzadeh, H., & Talaee, E. (2020). A systematic review on the impacts of game-based learning on argumentation skills. *Entertainment Computing, 35*, 100369.

NRC: National Research Council (2011). *Successful K–12 STEM education: Identifying effective approaches in science, technology, engineering, and mathematics*. The National Academies Press.

NRC: National Research Council. (2014). *Literacy for science: Exploring the intersection of the Next Generation Science Standards and Common Core for ELA standards: A workshop summary*. The National Academies Press.

NRC: National Research Council. (2022). *Science and engineering in preschool through elementary grades: The brilliance of children and strengths of educators.* The National Academies Press.

Nussbaum, E. M. (2021). Critical integrative argumentation: Toward complexity in students' thinking. *Educational Psychologist, 56*(1), 1–17.

Özdem Yilmaz, Y., Cakiroglu, J., Ertepinar, H., & Erduran, S. (2017). The pedagogy of argumentation in science education: science teachers' instructional practices. *International Journal of Science Education, 39*(11), 1443–1464.

Peterson, A. T., Beymer, P. N., & Putnam, R. T. (2018). Synchronous and asynchronous discussions: Effects on cooperation, belonging, and affect. *Online Learning Journal, 22*(4), 7–25.

Riel, J., & Lawless, K. A. (2022). Developing written argumentation skills with an educational simulation game (ESG): The design and implementation of the GlobalEd ESG. In P. Sullivan, B. Sullivan, & J. Lantz (Eds.), *Cases on innovative and successful uses of digital resources for online learning*. IGI Global.

Sandoval, W. A., Enyedy, N., Redman, E. H., & Xiao, S. (2019). Organizing a culture of argumentation in elementary science. *International Journal of Science Education, 41*(13), 1848–1869.

Sauvé, L., Renaud, L., Kaufman, D., & Marquis, J. S. (2007). Distinguishing between games and simulations: A systematic review. *Journal of Educational Technology & Society, 10*(3), 247–256.

Scardamalia, M., & Bereiter, C. (2006). Knowledge building: Theory, pedagogy, and technology. In K. Sawyer (Ed.), *Cambridge Handbook of the Learning Sciences* (pp. 97–118). Cambridge University Press.

Scogin, S. C., Kruger, C. J., Jekkals, R. E., & Steinfeldt, C. (2017). Learning by experience in a standardized testing culture: Investigation of a middle school experiential learning program. *Journal of Experiential Education, 40(*1), 39–57.

Shamir-Inbal, T., & Blau, I. (2021). Facilitating emergency remote K–12 teaching in computing-enhanced virtual learning environments during COVID-19 pandemic—Blessing or curse? *Journal of Educational Computing Research, 59*(7), 1243–1271.

Squazzoni, F., Jager, W., & Edmonds, B. (2014). Social simulation in the social sciences: A brief overview. *Social Science Computer Review, 32*(3), 279–294.

Suephatthima, B., & Faikhamta, C. (2018). Developing students' argument skills using socioscientific issues in a learning unit on the fossil fuel industry and its products. *Science Education International, 29*(3).

van den Hurk, A., Meelissen, M., & van Langen, A. (2018). Interventions in education to prevent STEM pipeline leakage. *International Journal of Science Education, 41*(2), 150–164.

Van Laar, E., Van Deursen, A. J., Van Dijk, J. A., & De Haan, J. (2017). The relation between 21st-century skills and digital skills: A systematic literature review. *Computers in Human Behavior, 72*, 577–588.

Vijayan, R. (2021). Teaching and learning during the COVID-19 pandemic: A topic modeling study. *Education Sciences, 11*(7), 347.

Vlachopoulos, D., & Makri, A. (2017). The effect of games and simulations on higher education: A systematic literature review. *International Journal of Educational Technology in Higher Education, 14*(1), 1–33.

Waring, S. M., & Robinson, K. S. (2010). Developing critical and historical thinking skills in middle grades social studies. *Middle School Journal, 42*(1), 22–28.

Yamagata-Lynch, L. C. (2014). Blending online asynchronous and synchronous learning. *International Review of Research in Open and Distributed Learning, 15*(2), 189–212.

Yeh, K. H., & She, H. C. (2010). On-line synchronous scientific argumentation learning: Nurturing students' argumentation ability and conceptual change in science context. *Computers & Education, 55*(2), 586–602.

Student Webcam Behaviors and Beliefs: Emergent Norms, Student Performance, and Cultural Differences

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Abstract
This study presents findings from a survey of 2298 university students from three countries (South Korea, Turkey, United States) focused on their use of and beliefs about webcams to support synchronous learning, including behaviors such as turning cameras on and multitasking. Additionally, it explores differences due to national culture, school achievement, and classroom seating preferences. As expected, findings show synchronous learning use increased during the pandemic. Student preferences for passive viewing behaviors are strong, along with preferences for keeping cameras off. Differences based on classroom seating preferences suggest that students who sit at the front are more likely than their peers to make decisions about webcam use based on involvement, attention, and preparedness. Cultural differences suggest different pedagogical expectations. Multitasking proved to be a complex behavior and is not always linked to poor achievement outcomes. This study has implications both for future research directions on synchronous learning, student webcam practices, and achievement and for how instructors design synchronous classes.

Keywords: higher education, norms, online learning, synchronous learning, webcam

Students have learned via synchronous video for more than two decades, but in many ways the learning medium was not heavily adopted in university settings until the beginning of 2020. One might argue that as an educational technology, adoption of synchronous video had not progressed beyond the early majority state in Rogers' (2003) Diffusion of Innovation model. Early adopters established a few norms for synchronous learning (SL), such as keeping one's microphone muted when not speaking and raising one's virtual hand to be called on (Suggs et al., 2010). However, there are many areas where norms have yet to be fully established, which was evident when instructors and students rapidly shifted to remote learning during the COVID-19 pandemic. One of these areas is the use of webcams. In this study, college students in three countries (South Korea, Turkey, United States) were surveyed to learn how they approached participation and webcam use in their synchronous courses during the first year of the COVID-19 pandemic. These self-reported SL behaviors are examined in light of similar face-to-face behaviors and grade point average to see if norms or common expectations emerged. Additionally, student behaviors are compared across the three countries to explore whether SL and webcam behaviors are universal or reflect different cultural expectations.

Literature Review

The earliest versions of video-based SL involved clusters of students at videoconference centers with some students perhaps co-located with their instructor (e.g., Goodfellow et al., 1996; Lawrence, 1995). Videoconferencing was expensive at this time, and not an activity one could engage in from their office or their home. After an initial period of intrigue, videoconferencing languished for a period, during which time learning management systems with asynchronous discussion tools rapidly proliferated. Learners took advantage of the opportunity to learn at home or while traveling thanks to continuous improvements in broadband and Wi-Fi along with widespread adoption of laptops, tablets, and smartphones, and asynchronous courses became the most common form of online learning. These ongoing technological developments also increased the potential for students to learn via synchronous video: webcams became a standard feature of laptops and smartphones; internet speeds increased, and streaming video services became common; and tools like Skype, FaceTime and Zoom were popularized for other purposes. During this time, even as some people were using this technology, few were researching it. In a systematic review of studies published between 1995 and 2018, Al-Samarraie (2019) found 335 articles on the topic of videoconference-based learning, but only 31 were empirical studies.

The COVID-19 pandemic was the catalyst for an atypical moment in educational technology adoption. Usually adoption occurs slowly, with social capital serving as a major driving force (Rogers, 2003). However, from spring 2020 through spring 2021, many brick-and-mortar higher education institutions changed their approach to learning out of necessity. This quick transition from physical classrooms to video-based ones, termed emergency remote teaching (ERT; Hodges et al., 2020) to maintain a distinction between this temporary solution and more typical and thoughtfully designed online learning courses for learners and instructors who opt in under normal conditions, resulted in unprecedented adoption levels for synchronous video-based learning.

The rationale for using synchronous video as an approach to ERT reflects a variety of beliefs and conveniences. First is the belief that learners who had previously chosen to learn in face-to-face classrooms would prefer synchronous over asynchronous learning. This belief reflects two assumptions: that synchronous learning requires less autonomy than asynchronous (Beyth-Marom et al., 2005), and that students enrolled in campus-based programs are not

expecting autonomous learning experiences. Second, instructors were encouraged to use synchronous tools during ERT under the assumption that preparation would be simpler (Hodges & Barbour, 2021). In other words, instructors who had planned to lecture in a classroom could simply replicate the lecture over a video connection, and real-time instructor-facilitated discussions would also be possible. However, the reality was a bit more complicated, and both instructors and students found themselves struggling to connect with students and function without established learning norms.

Why Webcams Matter

Webcams play an important part in synchronous learning experiences because they help decrease perceptions of transactional distance. Transactional distance is the subjective perception of the between instructors and learners in distance education. The three variables contributing to transactional distance are dialogue, structure, and learner autonomy, each of which contributes to how a person experiences not just a geographical, but also a psychological and communications gulf when learner partners are not co-located (Moore, 1993). Moore points out that different media directly affect transactional distance through the dialogue variable, determining the frequency, nature, and quality of communication across learning transactions.

In a synchronous class, transactional distance can be lessened by having webcams turned on, allowing participants to see each other's facial expressions and, when the audio channel is enabled and used, hear each other's voices in real time. Both audio and video channels have been found to be among the factors that help students and instructors with relationship development and communication in online courses (Falloon, 2011; Lowenthal et al., 2021). In a comparison study, there were no significant differences in achievement, community, or satisfaction between students in an asynchronous-only group and those with a synchronous component (Olson & McCracken, 2015). However, the synchronous group was limited to text chat interactions. In other studies, both asynchronous video (Lowenthal & Moore, 2020) and synchronous video (Angelone et al., 2020) were found to help increase perceptions of presence, Additionally, when transactional distance decreases, student satisfaction has been found to increase (Gavrilis et al., 2020). As a result, minimizing transactional distance via webcam use may be a worthwhile practice in synchronous courses.

Synchronous Learning Norms and Behaviors

Although webcam use is an appropriate way to reduce transactional distance and increase presence, it is not yet established as a norm in synchronous learning settings. By the time students enter the university setting, they typically have a strong sense of acceptable classroom behaviors. However, when the learning context or modality changes, existing norms must be reconsidered (Zydney et al., 2020). Although some norms may carry over from the prior learning environment, others may change. New technologies or learning expectations may bring about the need for entirely new norms. Instructors are typically considered in charge of learning environments and tasked with articulating and upholding these behavioral expectations, but in the absence of strong instructor leadership, students will work collaboratively to shape learning norms (Hod & Ben-Zvi, 2015).

In the context of SL, norms and practices surrounding webcam use, especially by students, have been a matter of debate. Within this debate, among the topics that are raised are how webcam use may affect student participation, student comfort, and student multitasking.

Webcams and Student Participation

The relationship between webcam use and student participation has not been heavily researched. In some settings camera use has been associated with attendance in SL (Marquart & Russell, 2020) and webcams are also commonly used as a proctoring tool (Daffin Jr. & Jones, 2018). Essentially, the role webcams are believed to play in participation relates to accountability. However, in another study their use was not related to student motivation (Giesbers et al., 2013). In a survey conducted in a large class, some students reported that keeping webcams off felt like a norm that had been established (Castelli & Sarvary, 2021), suggesting that other forces may influence webcam choices. However, instructors may not support this norm. A survey of instructors found that when student webcams were turned off, instructors had greater difficulty gauging student understanding (Gavrilis et al., 2020; Lowenthal et al., 2021), although another study suggested that some students are unaware that turning their webcams on serves a function like providing feedback to instructors (Yarmand et al., 2021).

Webcams and Student Comfort

Mandatory webcam use has been a topic of debate among instructors, noting that camera use may lead to a tradeoff between perceptions of presence and transactional distance, which are increased when cameras are turned on, and student comfort, which may decrease when cameras are turned on. Instructors may feel sensitive to this issue because they are prone to experiencing discomfort themselves when in front of the camera (Borup & Evmenova, 2019). Students have reported that concerns about their setting or appearance have led them to keep their cameras off (Castelli & Sarvary, 2021; Yarmand et al., 2021). Webcams not only raise issues of privacy (Castelli & Sarvary, 2021; Rajab & Soheib, 2021)—a concern shared with other modes of online learning (Tu, 2002)—but also of equity (Day & Verbiest, 2021). During the COVID-19 pandemic, instructors observed how mandatory webcam use exposes the socioeconomic inequities among students (Lowenthal et al., 2021). While webcams are beneficial to learning because they enhance social presence, the value of this presence is not universally recognized, and it may cause challenges for some learners.

Webcams and Multitasking

Having one's camera on during class has been likened to sitting in the high interaction zone of a classroom, with the assumption that it will reduce multitasking and lead to increased participation and learning (Peper et al., 2021). Although multitasking in online learning has not been heavily studied (Alghamdi et al., 2020), it can inhibit learner ability to perform cognitive tasks (Ekuni et al., 2022) and is greater in online settings where students are unmonitored (Lepp et al., 2019). In a study of workers, findings showed that when webcam audio and video are turned off, multitasking is more prevalent (Cao et al., 2021), suggesting that webcam use may discourage such behaviors by making them visible.

Face-to-face Classroom Behaviors and Outcomes

Although webcam norms are not well established, it is worth considering whether students carry over classroom behaviors to their new learning environments, establishing new behaviors online that allow them to engage in class in similar ways and have similar learning outcomes. These face-to-face classroom behaviors have been heavily studied in the past. For example, students who sit near the front of the classroom—the high interactional zone—typically have higher participation and fewer absences (Zomorodian et al., 2012). Other behaviors associated with sitting near the front include attention on task (Will et al., 2020) and notetaking

(Lindquist & McLean, 2011). Effects on performance and GPA are more complex, but a recent study found that class grade drops by row moving backwards (Will et al., 2020) and even in studies where students in front do not perform best, similarities are seen among students sitting in the same zone (Joshi et al., 2019). Seating preference is a complex issue, reflecting room size and design, student beliefs and locus of control (Xi et al., 2017), and regardless of where students sit, multitasking can detract from learning (Jamet et al., 2020). Whereas teachers can recommend that students sit up front where they can best pay attention and are least likely to multitask, similar SL behaviors are not yet established.

Cultural Norms

Cultural norms affect classroom norms. In other words, teaching and learning practices and expectations will vary not only by context, but also by national culture as has been found with other learning technologies and settings. For example, prior studies have found that Chinese learners were reticent to be active participants and had different pedagogical expectations in an online course heavily populated by North American and Western European participants (Dennen & Bong, 2018), and that American, Chinese, and Turkish learners have different perceptions of mobile learning (Hao et al., 2017). Students from collectivist and individualist cultures may differ from each other in terms of the perceived usefulness of online learning and their need for social spaces in their online classes (Zhao et al., 2020) as well as their preference for different types of cognitive activities (Zhu et al., 2009). Connecting back to the issue of webcam use in the synchronous learning classroom, not only are norms not fully established for when cameras should be on or off, cultural differences around these norms also remain uncertain. However, it would make sense if norms differ somewhat across cultures given established cross-cultural differences in related areas such as online learning participation (Yang et al., 2010), pedagogical expectations (Liu et al., 2010), and even facial behavior (McDuff et al., 2016).

Research Purpose and Questions

In this study, we investigate students' perceptions of SL and webcams, considering whether their preferences and behaviors have any relationship to achievement and face-to-face classroom behaviors. Additionally, we examine whether emergent SL behaviors differ by culture among American, Turkish, and Korean students. This study addresses the following research questions:

1. What factors influence students' use of webcams? Do students differ based on country, face-to-face classroom seating choice, and achievement?
2. What are students' webcam and related synchronous learning beliefs and behaviors? Do students differ based on country, face-to-face classroom seating choice, and achievement?
3. What are students' multitasking behaviors in online classes? Do students differ based on country, face-to-face classroom seating choice, and achievement?

Method

Participants

Participants in this study were 2,298 college students enrolled at institutions in the United States ($n = 408$), Turkey ($n = 925$), and South Korea ($n = 965$). Participants' ages ranged between 18 and 43 with a mean of 21.20 and standard deviation of 2.76. Their gender

identification was distributed as follows: 832 male (36.2%), 1,395 female (60.7%), and 37 non-binary (1.6%) with 34 participants (1.5%) declining to share gender.

Race and ethnicity data only were collected from participants in the United States as both Turkey and South Korea have a more homogenous population and race or ethnicity is not as a strong determinant of other social factors (such as socioeconomic status) as they are in the United States in these countries. There were 258 White (63.2%), 69 Asian (16.9%), 26 Black or African American (6.4%), 26 Hispanic or Latinx (6.4%), and one American Indian or Alaska Native (0.2%) participant from the United States. Additionally, 25 participants (6.1%) indicated more than one race while three participants (0.7%) identified themselves as "other."

Instruments and Data Collection

Data collection occurred via an online survey (see Appendix A). The online survey was based partly on items and findings from an earlier survey study of webcam use by learning professionals (Dennen et al., 2021) which focused on factors related to webcam use, webcam behaviors and beliefs, and multitasking behaviors. New items were added to collect data about face-to-face classroom seat choices and achievement (measured by GPA), and adjustments were made to some items to reflect the student context. The English version of the survey was constructed first and tested by six students for clarity and functionality. The survey was then translated into Turkish, and Korean using the back-translation method (Brislin, 1970) and validated by content and language experts before deployment. Potential participants were recruited via announcements in online classes, email and social media, and data were collected between April and June 2021. The study was approved by the researchers' Institutional Review Boards and all participants were volunteers.

Data Analysis

SPSS version 28 was used to calculate descriptive statistics for all items. Frequencies distributions were used to depict the responses of the whole sample as well as each subgroup used for comparison (country, seating choice, achievement). Chi-square tests of independence were used to look for significant differences in response patterns in each subgroup.

Results

This section begins with the presentation of participant background information, namely their face-to-face classroom seating preferences, GPA, and frequency of using SL tools. The remaining parts of the section are structured based on the research questions and present results about factors influencing students' webcam use, SL beliefs and behaviors, and multitasking behaviors in online classes.

Participant Backgrounds

Students were asked where they typically sit in a face-to-face classroom. Most reported sitting in the middle (1,302; 56.7%), followed by the front of the room (677; 29.5%) and the back of the room (319; 13.9%). They were also asked to share their GPA and were broken into three achievement groups: high (1,050; 45.7%), moderate (945; 41.1%), and low (106; 4.6%). These groups were used to answer the comparison parts of the research questions

To establish familiarity with synchronous learning, students were asked about the frequency with which they used synchronous video tools like Zoom for learning purposes prior to remote learning and during the period of remote learning (see Table 1). The results show that

the use of synchronous tools like Zoom increased in all three countries during the COVID-19 pandemic. According to the results, greater percentages of students used SL tools more frequently during the pandemic while only 14.6% of the participants used SL tools multiple times per week prior to the pandemic, that percentage increased to 80.8% during the pandemic.

Table 1
Frequency of Using SL Tools Prior to and During the COVID-19 Pandemic

	How often did you use synchronous tools like Zoom to meet with a class or other group of people prior to the COVID-19 pandemic?				How often have you typically used synchronous tools like Zoom to meet with a class or other group of people during the pandemic?			
	USA	TUR	KOR	Total	USA	TUR	KOR	Total
Daily	26	71	7	104	159	344	53	556
	6.4%	7.7%	0.7%	4.5%	39.0%	37.2%	5.5%	24.2%
4–6 times a week	26	66	16	108	143	364	273	780
	6.4%	7.1	1.7%	4.7%	35.0%	39.4%	28.3%	33.9%
2–3 times a week	23	40	62	125	76	84	360	520
	5.6%	4.3%	6.4%	5.4%	18.6%	9.1%	37.3%	22.6%
Once a week or less frequently	76	95	90	261	26	52	193	271
	18.6%	10.3%	9.3%	11.4%	6.4%	5.6%	20.0%	11.8%
Never	257	653	790	1700	4	81	86	171
	63.0%	70.6%	81.9%	74.0%	1.0%	8.8%	8.9%	7.4%

Factors Influencing Webcam Use

The first research question addressed the factors that influenced students' use of webcams. To answer the research question, a set of predefined items were presented to participants. They were asked to indicate factors that would influence their decision to turn on their webcam. Results are presented in Table 2. Most of the students reported the following factors affecting their webcam use in online classes: their surroundings (74.5%), whether turning webcams on is required (70.7%), whether others have webcams on or off (67.6%), and how they are dressed/groomed (56.3%). On the other hand, the following factors received low ratings by students: recording the class meeting (21.4%), the number of people in the class meeting (30.4%), their preparedness for class (32.8%), and the desire to talk during class (34.1%).

Table 2

Factors Affecting Students' Webcam Use by Country, Seating Choice, and Achievement

		Country				Seating Choice				Achievement			
		USA	TUR	KOR	Total	Front	Middle	Back	Total	High	Moderate	Low	Total
How I am dressed/groomed	*f*	319	504	470	1293	392	752	149	1293	644	501	51	1196
	%	78.2%	54.5%	48.7%	56.3%	57.9%	57.8%	46.7%	56.3%	61.3%	53.0%	48.1%	56.9%
My surroundings	*f*	325	733	655	1713	514	979	220	1713	793	703	69	1565
	%	79.7%	79.2%	67.9%	74.5%	75.9%	75.2%	69.0%	74.5%	75.5%	74.4%	65.1%	74.5%
My degree of involvement in the class meeting	*f*	277	365	255	897	292	504	101	897	434	335	41	810
	%	67.9%	39.5%	26.4%	39.0%	43.1%	38.7%	31.7%	39.0%	41.3%	35.4%	38.7%	38.6%
Number of people in the class meeting	*f*	206	285	207	698	206	406	86	698	340	270	29	639
	%	50.5%	30.8%	21.5%	30.4%	30.4%	31.2%	27.0%	30.4%	32.4%	28.6%	27.4%	30.4%
Whether others have webcams on or off	*f*	355	506	692	1553	420	925	208	1553	789	592	56	1437
	%	87.0%	54.7%	71.7%	67.6%	62.0%	71.0%	65.2%	67.6%	75.1%	62.6%	52.8%	68.4%
My ability to give my full attention to the class meeting	*f*	211	396	217	824	289	441	94	824	373	330	32	735
	%	51.7%	42.8%	22.5%	35.9%	42.7%	33.9%	29.5%	35.9%	35.5%	34.9%	30.2%	35.0%
Whether I want to talk during class	*f*	175	407	202	784	252	419	113	784	354	316	31	701
	%	42.9%	44.0%	20.9%	34.1%	37.2%	32.2%	35.4%	34.1%	33.7%	33.4%	29.2%	33.4%
Whether I am prepared for class	*f*	118	419	217	754	237	432	85	754	327	317	31	675
	%	28.9%	45.3%	22.5%	32.8%	35.0%	33.2%	26.6%	32.8%	31.1%	33.5%	29.2%	32.1%
Whether the class is being recorded	*f*	149	207	136	492	153	275	64	492	252	171	22	445
	%	36.5%	22.4%	14.1%	21.4%	22.6%	21.1%	20.1%	21.4%	24.0%	18.1%	20.8%	21.2%
Whether it is required	*f*	320	597	707	1624	446	953	225	1624	785	648	60	1493
	%	78.4%	64.5%	73.3%	70.7%	65.9%	73.2%	70.5%	70.7%	74.8%	68.6%	56.6%	71.1%
None of these items	*f*	4	33	25	62	21	31	10	62	19	31	4	54
	%	1.0%	3.6%	2.6%	2.7%	3.1%	2.4%	3.1%	2.7%	1.8%	3.3%	3.8%	2.6%
Total	*f*	408	925	965	2298	677	1302	319	2298	1050	945	106	2101

To investigate group differences, we conducted chi-square tests of independence for country, seating choice, and achievement. Results are presented in Appendix B. Out of eleven chi-square tests of independence for country, ten tests were significant at *a* = .001 level and one test was significant at *a* = .05 level. Seven chi-square tests of independence for seating choice were significant (two at *a* = .001, three at *a* = .01, and two at *a* = .05), and five for achievement were significant (three at *a* = .001, one at *a* = .01 level, and one at *a* = .05).

Country differences show varying ways that webcam use reflects personal appearances, peer group behavior, and class preparation. A greater percentage of students from the United States reported that how they are dressed or groomed would affect their webcam use (78.2%) compared to students from Turkey (54.5%) and South Korea (48.7%). Surroundings mattered more to American (79.7%) and Turkish (79.2%) students than to South Korean students (67.9%). Furthermore, more Turkish students (45.3%) reported more than American (28.9%) or South Korean (22.5%) students that their webcam use would be influenced by whether they are prepared for class. They were also the group least likely to be swayed by whether their classmates had cameras on (54.7% compared to 71.7% for South Korean students and 87.0% for American students).

Classroom seating differences showed that students sitting in the front and middle of the face-to-face classroom reported higher levels of concern with personal dress and grooming (57.9% and 57.8%, respectively) and surroundings (75.9% and 75.2%, respectively) than their peers who typically sit in the back of the classroom (46.7% dress/grooming: 69.0% surroundings). Greater percentages of students who sit in the front of the room stated that their

webcam use behavior would be influenced by their involvement in the class meeting (43.1%), attention to the class meeting (42.7%), and preparedness for the class (35.0%) when compared to their peers sitting in the middle or back of the room. However no significant differences were found among groups responses based on meeting size, desires to talk during class, or class recording. Finally, greater numbers of students with high achievement reported the following factors as an influence on their decision to use a webcam: how they are dressed/groomed (61.3%), the degree of involvement (41.3%), whether others have webcams on or off (75.1%), availability of class recording (24.0%), and whether turning webcam on is required (74.8%). Items suggest that students were concerned with meeting requirements and how others in the class perceived them. No significant differences were found among group responses to questions about ability to give the class full attention, desire to talk during class, or class preparation.

Webcam and Related Synchronous Learning Beliefs and Behaviors

The second research question addressed students' webcam and related SL beliefs and behaviors. Response frequencies are presented in Table 3. According to the results, more than half of the students prefer to watch class recordings rather than attend the live session (50.9%), which would place them in a situation where webcam preferences are moot. Only a minority of students felt they should be required to turn webcams on during class lectures (12.1%), class discussions (19.8%), or in breakout groups (20.1%).

Table 3

Students' Synchronous Learning Beliefs and Behaviors by Country, Seating Choice, and Achievement

		Country				Seating Choice				Achievement			
		USA	TUR	KOR	Total	Front	Middle	Back	Total	High	Moderate	Low	Total
I learn better when my webcam is on.	f	123	152	231	506	196	240	70	506	247	197	30	474
	%	30.1%	16.4%	23.9%	22.0%	29.0%	18.4%	21.9%	22.0%	23.5%	20.8%	28.3%	22.6%
I am more likely to prepare for class if I am required to keep my webcam on.	f	127	284	284	695	227	382	86	695	324	289	32	645
	%	31.1%	30.7%	29.4%	30.2%	33.5%	29.3%	27.0%	30.2%	30.9%	30.6%	30.2%	30.7%
I am more likely to pay close attention in class if I am required to keep my webcam on.	f	225	303	352	880	310	462	108	880	434	344	42	820
	%	55.1%	32.8%	36.5%	38.3%	45.8%	35.5%	33.9%	38.3%	41.3%	36.4%	39.6%	39.0%
I am more likely to speak in class if I am required to keep my webcam on.	f	174	197	189	560	196	289	75	560	288	202	28	518
	%	42.6%	21.3%	19.6%	24.4%	29.0%	22.2%	23.5%	24.4%	27.4%	21.4%	26.4%	24.7%
I am likely to have private chat or text messages with classmates during class.	f	190	229	190	609	197	326	86	609	321	233	19	573
	%	46.6%	24.8%	19.7%	26.5%	29.1%	25.0%	27.0%	26.5%	30.6%	24.7%	17.9%	27.3%
I prefer to watch class recordings rather than attend the live session.	f	123	351	695	1169	262	725	182	1169	540	505	49	1094
	%	30.1%	37.9%	72.0%	50.9%	38.7%	55.7%	57.1%	50.9%	51.4%	53.4%	46.2%	52.1%
I think students should be required to turn their webcams on during class lectures.	f	50	98	130	278	107	138	33	278	135	110	15	260
	%	12.3%	10.6%	13.5%	12.1%	15.8%	10.6%	10.3%	12.1%	12.9%	11.6%	14.2%	12.4%
I think students should be required to turn their webcams on during class discussions.	f	132	121	201	454	166	240	48	454	241	170	17	428
	%	32.4%	13.1%	20.8%	19.8%	24.5%	18.4%	15.0%	19.8%	23.0%	18.0%	16.0%	20.4%
I think students should be required to turn their webcams on in breakout groups.	f	139	109	213	461	151	267	43	461	258	165	20	443
	%	34.1%	11.8%	22.1%	20.1%	22.3%	20.5%	13.5%	20.1%	24.6%	17.5%	18.9%	21.1%
None of these statements is true for me.	f	33	234	0	267	108	131	28	267	106	104	13	223
	%	8.1%	25.3%	0.0%	11.6%	16.0%	10.1%	8.8%	11.6%	10.1%	11.0%	12.3%	10.6%
Total	f	408	925	965	2298	677	1302	319	2298	1050	945	106	2101

Group differences were investigated via chi-square tests of independence for country, seating choice, and achievement. Results are presented in Appendix C. According to the results, out of ten chi-square tests of independence for country, eight tests were significant at $a = .001$ level while two tests did not reveal any significant differences. Seven of the ten tests for seating choice were signification (five at $a = .001$ and three at $a = .01$), and only three were significant for achievement (one test at $a = .001$ and two $a = .01$).

In terms of country differences, students from the United States consistently reported higher rates of webcam-related accountability (i.e., more likely to learn better, pay close attention, and speak in class) than their Turkish and South Korean counterparts, as can be seen in Table 3. In addition, having private chat or text messages with classmates during class sessions was more commonly reported among American students. Most students from South Korea (72.0%) indicated that they prefer to watch class recordings rather than attend the live session, which is close to twice the response from Turkish (37.9%) and American (30.1%) students.

Greater percentages of students who sit in the front of the room reported preparing for class (33.5%) and paying close attention (45.8%) if they are required to keep their webcam on compared to students who sit elsewhere. However, there was an opposite relationship regarding preference for class recordings. Greater percentages of students who sit in the middle (55.7%) and back (57.1%) of the room reported that they prefer class recordings to the live session compared to students who sit in the front of the room (38.7%). Smaller percentages of students who sit in the back of the room reported that they think students should be required to turn webcams on during class lectures (10.3%), class discussions (15.0%), and in breakout groups (13.5%) compared to students who sit in the front and middle of the room; students who sit at the front chose this response in the highest proportions for all three items, although overall support for mandatory camera use was low.

Students' beliefs and behaviors had the fewest group differences when considering achievement level. Interestingly, high achieving students (30.6%) reported engaging in private chat with classmates more than students in the moderate (24.7%) and low (17.9%) groups. They were also more likely to indicate a preference for requiring webcams in breakout groups (24.6%), although this was not popular overall.

Multitasking Behaviors in Online Classes

The third research question addressed students' multitasking behaviors in online classes. Students were presented with five items addressing multitasking behaviors in online classes and were asked to indicate their agreement using a five-point Likert scale ranging from 1: *Strongly Disagree* to 5: *Strongly Agree*. We investigated students' multitasking behaviors with respect to country, face-to-face classroom seating choice, and achievement and the results are presented in Table 4.

Table 4

Multitasking Behaviors by Country, Seating Choice, and Achievement

			Country			Seating Choice			Achievement		
			USA (N = 408)	TUR (N=925)	KOR (N=965)	Front (N=677)	Middle (N=1302)	Back (N=319)	High (N=1050)	Moderate (N=945)	Low (N=106)
I multitask on my computer when in virtual classes (e.g., work within other windows)	SD	f	18	130	86	89	114	31	100	94	11
		%	4.4%	14.1%	8.9%	13.1%	8.8%	9.7%	9.5%	9.9%	10.4%
	SWD	f	20	264	211	137	300	58	242	194	14
		%	4.9%	28.5%	21.9%	20.2%	23.0%	18.2%	23.0%	20.5%	13.2%
	NAND	f	12	251	282	146	315	84	203	258	23
		%	2.9%	27.1%	29.2%	21.6%	24.2%	26.3%	19.3%	27.3%	21.7%
	SWA	f	154	205	304	189	387	87	318	264	35
		%	37.7%	22.2%	31.5%	27.9%	29.7%	27.3%	30.3%	27.9%	33.0%
	SA	f	204	75	82	116	186	59	187	135	23
		%	50.0%	8.1%	8.5%	17.1%	14.3%	18.5%	17.8%	14.3%	21.7%
I multitask within my physical space when in virtual classes (e.g., knitting, cooking)	SD	f	53	129	213	124	229	42	200	145	20
		%	13.0%	13.9%	22.1%	18.3%	17.6%	13.2%	19.0%	15.3%	18.9%
	SWD	f	69	293	325	195	405	87	328	277	19
		%	16.9%	31.7%	33.7%	28.8%	31.1%	27.3%	31.2%	29.3%	17.9%
	NAND	f	33	215	257	123	310	72	193	237	32
		%	8.1%	23.2%	26.6%	18.2%	23.8%	22.6%	18.4%	25.1%	30.2%
	SWA	f	150	217	130	154	261	82	233	193	20
		%	36.8%	23.5%	13.5%	22.7%	20.0%	25.7%	22.2%	20.4%	18.9%
	SA	f	103	71	40	81	97	36	96	93	15
		%	25.2%	7.7%	4.1%	12.0%	7.5%	11.3%	9.1%	9.8%	14.2%
I am less likely to multitask if my webcam is on	SD	f	29	67	44	49	70	21	52	66	7
		%	7.1%	7.2%	4.6%	7.2%	5.4%	6.6%	5.0%	7.0%	6.6%
	SWD	f	28	114	123	69	156	40	126	109	11
		%	6.9%	12.3%	12.7%	10.2%	12.0%	12.5%	12.0%	11.5%	10.4%
	NAND	f	51	159	294	120	296	88	184	236	32
		%	12.5%	17.2%	30.5%	17.7%	22.7%	27.6%	17.5%	25.0%	30.2%
	SWA	f	137	349	360	241	504	101	402	335	33
		%	33.6%	37.7%	37.3%	35.6%	38.7%	31.7%	38.3%	35.4%	31.1%
	SA	f	163	236	144	198	276	69	286	199	23
		%	40.0%	25.5%	14.9%	29.2%	21.2%	21.6%	27.2%	21.1%	21.7%
I turn my webcam off if I need to multitask	SD	f	29	52	102	62	96	25	82	74	14
		%	7.1%	5.6%	10.6%	9.2%	7.4%	7.8%	7.8%	7.8%	13.2%
	SWD	f	43	96	204	91	200	52	178	135	15
		%	10.5%	10.4%	21.1%	13.4%	15.4%	16.3%	17.0%	14.3%	14.2%
	NAND	f	47	174	334	138	327	90	210	261	32
		%	11.5%	18.8%	34.6%	20.4%	25.1%	28.2%	20.0%	27.6%	30.2%
	SWA	f	151	401	238	238	458	94	378	302	23
		%	37.0%	43.4%	24.7%	35.2%	35.2%	29.5%	36.0%	32.0%	21.7%
	SA	f	138	202	87	148	221	58	202	173	22
		%	33.8%	21.8%	9.0%	21.9%	17.0%	18.2%	19.2%	18.3%	20.8%
When my webcam is off, I am more likely to walk away from the class	SD	f	34	137	193	109	207	48	176	145	13
		%	8.3%	14.8%	20.0%	16.1%	15.9%	15.0%	16.8%	15.3%	12.3%
	SWD	f	47	189	227	116	280	67	214	196	11
		%	11.5%	20.4%	23.5%	17.1%	21.5%	21.0%	20.4%	20.7%	10.4%
	NAND	f	32	197	361	142	356	92	234	271	37
		%	7.8%	21.3%	37.4%	21.0%	27.3%	28.8%	22.3%	28.7%	34.9%
	SWA	f	125	236	138	161	274	64	227	190	24
		%	30.6%	25.5%	14.3%	23.8%	21.0%	20.1%	21.6%	20.1%	22.6%
	SA	f	170	166	46	149	185	48	199	143	21
		%	41.7%	17.9%	4.8%	22.0%	14.2%	15.0%	19.0%	15.1%	19.8%

Note. SD: Strongly disagree; SWD: Somewhat disagree; NAND: Neither agree nor disagree; SWA: Somewhat agree; SA: Strongly agree

We further examined group differences in terms of students' multitasking behaviors via chi-square tests of independence for country, seating choice, and achievement. Full results are presented in Appendix D. According to the results, all of the chi-square tests of independence for country, seating choice, and achievement showed that there were statistically significant differences among groups. All five tests for country, three for seating choice, and one for achievement group differences were significant at the $a = .001$ level.

Notably, a greater percentage of students from the United States either somewhat agreed or strongly agreed that they multitask on their computer (87.7%) and within their physical space (62.0%) when in virtual classes. In both instances, this represents a rate of multitasking more than twice what was reported by Turkish and South Korean students. Multitasking while the webcam is on appeared to be more common among Turkish students thank among the other groups. On the other hand, students from South Korea were less likely to walk away from the class when their webcam is off.

While there were strong differences in multitasking behaviors among students from the three countries, differences based on classroom seating choice and achievement generally were less pronounced. Still, students responding the strongly or somewhat agreed that they would turn off their webcam to multitask decreased from a high of 57.1% among students who reported sitting at the front of the classroom to 52.2% and 47.7% for those who choose seats in the middle or back, respectively. High-achieving students were most likely to report that having webcams turned on was a deterrent to multitasking, with 65.5% strongly or somewhat agreeing with this statement compared to 56.5% and 52.8% of their moderate and low achievement peers, respectively. Low-achieving students were most likely to strongly or somewhat agree that they multitask on their computer (54.7%) compared to the high (48.1%) and moderate (42.2%) achievement groups.

Discussion

University students' SL experiences during the pandemic have brought familiarity with synchronous learning tools, but this familiarity has not necessarily led to unified expectations surrounding webcam use. The students in this study suggest that practices and beliefs surrounding webcam use differ by national culture, academic achievement, and preferred seating in the face-to-face classroom. Awareness of these differences can be used to help instructors design cross-cultural synchronous learning experiences, and identify behaviors associated with desired classroom behaviors and academic performance.

The extent to which these students will continue to experience SL may vary. Nikou (2020–21) found that university instructors were most likely to continue using synchronous learning tools after the period of ERT ended if they perceived them as useful and had been satisfied with their earlier experiences. The same may be true for learners. Campus student enrollment in online courses has steadily increased, as have online enrollments in graduate programs (Allen & Seaman, 2017), but students may self-select into asynchronous courses if their synchronous learning experiences during ERT were unsatisfactory.

A major debate among educators has been whether students should be required to have webcams turned on (Torchia, 2021). Most of these participants indicated that cameras should not be required, with a difference as well between lecture, a passive learning activity, and active learning activities. Combined with data showing that having cameras on may increase attention, speaking during class, and learning, especially for some students in the United States, instructors might consider requiring or at least encouraging students to turn their cameras on for interactive portions of a synchronous class session. In another study, students found the fatigue associated

with attending to computer-mediated communication cues (Wiederhold, 2020) lessened when they experienced greater social presence and saw their peers in the learning space (Peper et al., 2021).

Naturalistic webcam behaviors appear to be driven by image-related factors. These students were likely to indicate that surroundings and personal grooming were influential in their camera decisions. This was more pronounced among the United States students, with findings much like the learning professionals in Dennen's (2021) study which also drew a sample from the United States. Another parallel between the two studies was the power of peers in influencing behavior. People are likely to follow the lead of others, whether that be in turning a webcam on or keeping it off. This finding suggests that should an instructor want students to keep their cameras on, the key is to get a subset of students to set an example, perhaps through requiring it and perhaps also through praise. The high-achieving students may be the starting point; they were most likely to be swayed by these elements.

The connection between sitting at the front of the classroom and being more likely than peers to have webcam behavior influenced by class involvement, attention, and preparedness is not surprising. Collectively these are all behaviors one would associate with a student who strives to do well, who may also be a high-achieving student. This finding suggests that instructors should be sure to provide opportunities for students to be involved and to require preparedness, thereby setting up a learning environment that fosters and supports positive learning behaviors.

By default, students tend to adopt a passive position in the online classroom, with many preferring to keep their cameras off and to watch a recorded class rather than participate in a live class. These findings also suggest that some face-to-face classroom behaviors have analogous behaviors in the online synchronous classroom. For example, high-performing students are more likely than lower achieving students to report behaviors contingent on and associated with having social presence and being an active participant in class, and lower achieving students are more likely than others to report that having their webcam on encourages them to pay attention, suggesting that they feel less able to self-regulate.

These connections between student behaviors and achievement, which are like those found in studies of face-to-face classrooms (e.g., Will et al., 2020; Zomorodian et al., 2012), have implications for future research and practice on synchronous online learning. For example, instructors might recommend attending live sessions as a primary form of learning so students can benefit from the potential for interaction. Recordings can still be made, but their use might be relegated to supporting review activities or making up for an unavoidable absence. Not only are recorded classes easy for students to overlook, but students may multitask or play them back at faster speeds to save time (Cardall et al., 2008). Students who skip class and put off coursework in hopes of last-minute cramming may find that watching videos at double speed does not serve them well in terms of learning retention. Similarly, these findings challenge instructors to make their SL classes worth attending live. To that end, instructors can build interaction into their classes and use abundant visuals, which other research has shown to increase attendance (Gupta & Saks, 2013), and which also may reduce the desire to multitask during class.

Multitasking, however, appears to be a complex behavior and not necessarily a negative one. This study found that multitasking via text chat was more likely to be used among high-achieving students, suggesting that it may be relevant to attention and learning, contradicting studies that suggest multitasking detracts from self-regulation (Alvarez-Risco et al., 2020).

Although the survey did not inquire about specific details, students who use the text chat may be engaged in on-topic backchanneling with their peers. Backchanneling has been found relevant to learning in other studies (Wolf, 2008), and could be a good sign that students are engaged and self-regulating to practice and fill in necessary learning information among their peers. Instructors should consider the role chat plays in supporting learning activities and both interact with students in the chat space as well as encourage students to use the chat tools to interact with their peers in meaningful ways. High-achieving students appear to have learned how backchannel chat can support learning, whereas findings from other studies suggest that overall students do not recognize the potential of chat as a learning support (Sprenger & Schwaninger, 2021). By promoting chat as a learning tool and integrating it into class activities, instructors can encourage both learning interactions and live session attendance.

The cultural differences noted among the three countries suggest different pedagogical expectations surrounding coursework. For example, the South Korean students were most likely to watch class recordings, implying that an instructor might be lecturing and nothing would be lost by watching a video versus participating during the live session. Conversely, the American students' responses that showed they were more likely than the other groups to participate during class may reflect an expectation that their instructors would require and plan for participation.

Although this sample is insufficient for generalizing to entire national populations of learners, it nonetheless suggests that learners are entering the synchronous learning space with different notions of what online learners should do. Prior research presents similar findings regarding cultural differences in terms of learner preferences and behaviors in online learning. For example, a recent study found that Turkish students were less likely to prefer and feel satisfied with online learning than students from the United States (Aguilera-Hermida et al., 2021), which may also relate to this study's finding that Turkish students are less likely than others to turn on webcams. Other studies have also affirmed that cultural differences between collectivist and individualist countries influence online learning behaviors and technology use (Dennen & Bong, 2018; Zhao et al., 2020), although these differences appear to increasingly have less sway on learner behaviors and also have limited influence on outcomes (Boyle et al., 2020).

Conclusion

This study sheds light on student comfort and enjoyment of SL, encouraging instructors to carefully consider the complexity and situational nature of using synchronous technologies and requiring webcams for learning. Instructors should not embrace the myth of digital natives and assume that young adults, who spend a lot of time online watching videos and communicating with friends via video chat tools, are prepared and motivated to use similar tools in a class setting. In practice the way that university students use technology to fulfill personal needs can be narrow (Margaryan et al., 2011). In other words, the tools they use and the way they use those tools to interact socially differ from learning-related tools and interactions. Additionally, university students' desire to maintain separation between personal and educational settings as well as to experience learning as a private phenomenon as noted by Dennen and Burner (2017) may drive them to keep webcams off when learning. After all, the experience of leaving one's home to interact with instructors and peers is very different from inviting those people into one's home, even if just through the limited view of a webcam lens.

In terms of norms for the future of synchronous learning, instructors may wish to set expectations for student behaviors that are context specific. In other words, keeping cameras off

may be acceptable during passive activities, but cameras may be requested to be turned on for interactive and small group work. Noting that student behaviors trend toward passive approaches with lower levels of social presence, instructors may choose to take on the challenge of promoting active learning in synchronous spaces and openly discuss with students the rationale behind these activities and any camera-on policies they instate. Maintaining options for learners who lack the ability to keep their cameras on should also be possible, and this should be done in a manner that is respectful of any challenges these learners may face. Additionally, instructors might share with students which learning behaviors are common to high-achieving students and which are common to low-achieving students to promote productive learning behaviors.

The major limitation of this study is the sample, which represents students from three institutions in three countries. Although the sample is large, students at a single institution may not be representative of students more generally or students within a specific country. A replication of this study with a broader sample (i.e., students from multiple institutions and additional countries) would help confirm the findings, although it is worth noting that overall trends regarding webcam beliefs and attitudes align with Dennen et al.'s (2021) similar survey study of learning professionals in the United States.

More research is needed to directly assess the connection between webcam use, live attendance, multitasking, and achievement outcomes. Follow-up studies that extend beyond self-report measures would be helpful to affirm whether these perceived connections are evident in actual student behaviors in grades. It is also possible that student best practices in the SL setting will vary based on contextual factors (e.g., class size, class activities) much as they do in the face-to-face setting (Xi et al., 2017). Future studies should be situated in specific course contexts with findings enhanced by rich description of the learning setting. Collectively, this line of research will help instructors better design and teach in an online synchronous mode and will lead to empirically supported recommendations for learner success in synchronous courses.

Declarations

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The authors assert that approval was obtained from an ethics review board (IRB) at Florida State University, USA.

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References

Aguilera-Hermida, A. P., Quiroga-Garza, A., Gomez-Mendoza, S., Del Rio Villanueva, C. A., Avolio Alecchi, B., & Avci, D. (2021). Comparison of students' use and acceptance of emergency online learning due to COVID-19 in the USA, Mexico, Peru, and Turkey. *Education and Information Technologies*, *26*(6), 6823–6845. https://doi.org/10.1007/s10639-021-10473-8

Al-Samarraie, H. (2019). A scoping review of videoconferencing systems in higher education. *The International Review of Research in Open and Distributed Learning*, *20*(3). https://doi.org/10.19173/irrodl.v20i4.4037

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

Allen, I. E., & Seaman, J. (2017). *Digital compass learning: Distance education enrollment report 2017*. Babson Survey Research Group, e-Literate, and WCET. https://onlinelearningsurvey.com/reports/digtiallearningcompassenrollment2017.pdf

Alvarez-Risco, A., Estrada-Merino, A., Anderson-Seminario, M. d. l. M., Mlodzianowska, S., García-Ibarra, V., Villagomez-Buele, C., & Carvache-Franco, M. (2020). Multitasking behavior in online classrooms and academic performance: case of university students in Ecuador during COVID-19 outbreak. *Interactive Technology and Smart Education*, *18*(3), 422–434. https://doi.org/10.1108/itse-08-2020-0160

Angelone, L., Warner, Z., & Zydney, J. M. (2020). Optimizing the technological design of a blended synchronous learning environment. *Online Learning*, *24*(3). https://doi.org/10.24059/olj.v24i3.2180

Beyth-Marom, R., Saporta, K., & Caspi, A. (2005). Synchronous vs. asynchronous tutorials. *Journal of Research on Technology in Education*, *37*(3), 245–262. https://doi.org/10.1080/15391523.2005.10782436

Borup, J., & Evmenova, A. (2019). The effectiveness of professional development in overcoming obstacles to effective online instruction in a college of education. *Online Learning*, *23*(2). https://doi.org/10.24059/olj.v23i2.1468

Boyle, G. J., Wongsri, N., Bahr, M., Macayan, J. V., & Bentler, P. M. (2020). Cross-cultural differences in personality, motivation and cognition in Asian vs. Western societies. *Personality and Individual Differences*, *159*. https://doi.org/10.1016/j.paid.2020.109834

Cao, H., Lee, C.-J., Iqbal, S., Czerwinski, M., Wong, P., Rintel, S., Hecht, B., Teevan, J., & Yang, L. (2021, May 8–13). *Large scale analysis of multitasking behavior during remote meetings* [Conference presentation]. CHI Conference on Human Factors in Computing Systems, Yokohama, Japan.

Cardall, S., Krupat, E., & Ulrich, M. (2008). Live lecture versus video-recorded lecture: Are students voting with their feet? *Academic Medicine*, *83*(12). https://doi.org/10.1097/ACM.0b013e31818c6902

Castelli, F. R., & Sarvary, M. A. (2021). Why students do not turn on their video cameras during online classes and an equitable and inclusive plan to encourage them to do so. *Ecology and Evolution*, *11*(8), 3565–3576. https://doi.org/10.1002/ece3.7123

Daffin, L. W., Jr., & Jones, A. A. (2018). Comparing student performance on proctored and non-proctored exams in online psychology courses. *Online Learning*, *22*(1). https://doi.org/10.24059/olj.v22i1.1079

Day, J., & Verbiest, C. (2021). Lights, camera, action? A reflection of utilizing web cameras during synchronous learning in teacher education. *The Teacher Educators' Journal*, *4*, 3–21.

Dennen, V. P., & Bong, J. (2018). Cross-cultural dialogues in an open online course: Navigating national and organizational cultural differences. *TechTrends*, *62*, 383–392. https://doi.org/10.1007/s11528-018-0276-7

Dennen, V. P., & Burner, K. J. (2017). Identity, context collapse, and Facebook use in higher education: Putting presence and privacy at odds. *Distance Education*, *38*(2), 173–192. https://doi.org/10.1080/01587919.2017.1322453

Dennen, V. P., Word, K. D., & Arslan, Ö. (2021). *Webcams at work: A survey of learning professionals' practices and perceptions*. FSU. http://purl.flvc.org/fsu/fd/FSU_libsubv1_scholarship_submission_1621457890_5284fd79

Ekuni, R., Macacare, O. T., & Pompeia, S. (2022). Reducing the negative effects of multitasking on online or distance learning by using retrieval practice [Advance online publication]. *Scholarship of Teaching and Learning in Psychology*. https://doi.org/https://doi.org/10.1037/stl0000314

Falloon, G. (2011). Making the connection. *Journal of Research on Technology in Education*, *43*(3), 187–209. https://doi.org/10.1080/15391523.2011.10782569

Gavrilis, V., Mavroidis, I., & Giiossos, Y. (2020). Transactional distance and student satisfaction in a postgraduate distance learning program. *Turkish Online Journal of Distance Education*, *21*(3), Article 5.

Giesbers, B., Rienties, B., Tempelaar, D., & Gijselaers, W. (2013). Investigating the relations between motivation, tool use, participation, and performance in an e-learning course using web-videoconferencing. *Computers in Human Behavior*, *29*(1), 285–292. https://doi.org/10.1016/j.chb.2012.09.005

Goodfellow, R., Jefferys, I., Milest, T., & Shirra, T. (1996). Face-to-face language learning at a distance? A study of a videoconference try-out. *ReCALL*, *8*(2), 5–16. https://doi.org/10.1017/s0958344000003530

Gupta, A., & Saks, N. S. (2013). Exploring medical student decisions regarding attending live lectures and using recorded lectures. *Med Teach*, *35*(9), 767–771. https://doi.org/10.3109/0142159X.2013.801940

Hao, S., Cui, M., Dennen, V. P., Türel, Y. K., & Mei, L. (2017). Analysis of mobile learning as an innovation in higher education: A comparative study of three countries. *International Journal of Mobile Learning and Organisation*, *11*(4), 314–339.

Hod, Y., & Ben-Zvi, D. (2015). Students negotiating and designing their collaborative learning norms: A group developmental perspective in learning communities. *Interactive Learning Environments*, *23*(5), 578–594. https://doi.org/10.1080/10494820.2015.1063511

Hodges, C., & Barbour, M. K. (2021). Assessing learning during Emergency Remote Teaching. *Italian Journal of Educational Technology*, *29*(2), 85–98. https://doi.org/10.17471/2499-4324/1208

Hodges, C., Moore, S., Lockee, B., Trust, T., & Bond, A. (2020). The difference between emergency remote teaching and online learning. *EDUCAUSE Review*, *27*.

Jamet, E., Gonthier, C., Cojean, S., Colliot, T., & Erhel, S. (2020). Does multitasking in the classroom affect learning outcomes? A naturalistic study. *Computers in Human Behavior*, *106*. https://doi.org/10.1016/j.chb.2020.106264

Joshi, G. P., Jha, S., Cho, S., Seo, C., Son, L. H., & Thong, P. H. (2019). Influence of multimedia and seating location in academic engagement and grade performance of students. *Computer Applications in Engineering Education*, *28*(2), 268–281. https://doi.org/10.1002/cae.22190

Lawrence, B. H. (1995). Teaching and learning via videoconference: The benefits of cooperative learning. *Journal of Educational Technology Systems*, *24*(2), 145–149. https://doi.org/10.2190/9WFK-58Q2-E5XQ-0DKA

Lepp, A., Barkley, J. E., Karpinski, A. C., & Singh, S. (2019). College students' multitasking behavior in online versus face-to-face courses. *SAGE Open*, *January-March*, 1-9.

Lindquist, S. I., & McLean, J. P. (2011). Daydreaming and its correlates in an educational environment. *Learning and Individual Differences*, *21*(2), 158–167. https://doi.org/https://doi.org/10.1016/j.lindif.2010.12.006

Liu, X., Liu, S., Lee, S. H., & Magjuka, R. J. (2010). Cultural differences in online learning: International student perceptions. *Journal of Educational Technology & Society*, *13*(3), 177–188.

Lowenthal, P. R., & Moore, R. L. (2020). Exploring student perceptions of Flipgrid in online courses. *Online Learning*, *24*(4). https://doi.org/10.24059/olj.v24i4.2335

Lowenthal, P. R., West, R. E., Archambault, L., Borup, J., & Belt, E. (2021). Faculty perceptions of using synchronous video-based communication technology. *Online Learning*, *25*(4). https://doi.org/10.24059/olj.v25i4.2890

Margaryan, A., Littlejohn, A., & Vojt, G. (2011). Are digital natives a myth or reality? University students' use of digital technologies. *Computers & Education*, *56*(2), 429–440.

Marquart, M., & Russell, R. (2020). Dear professors: Don't let student webcams trick you. *EDUCAUSE Review*. https://er.educause.edu/blogs/2020/9/dear-professors-dont-let-student-webcams-trick-you

McDuff, D., Girard, J. M., & el Kaliouby, R. (2016). Large-scale observational evidence of cross-cultural differences in facial behavior. *Journal of Nonverbal Behavior*, *41*(1), 1–19. https://doi.org/10.1007/s10919-016-0244-x

Moore, M. G. (1993). Theory of transactional distance. In D. Keegan (Ed.), *Theoretical principles of distance education* (pp. 22–38). Routledge.

Nikou, S. A. (2020–21). Web-based videoconferencing for teaching online: Continuance intention to use in the post-COVID-19 period. *Interaction Design and Architecture(s) Journal*, *47*, 123–143.

Olson, J. S., & McCracken, F. E. (2015). Is it worth the effort? The impact of incorporating synchronous lectures into an online course. *Online Learning*, *19*(2). http://dx.doi.org/10.24059/olj.v19i2.499

Peper, E., Wilson, V., Martin, M., Rosegard, E., & Harvey, R. (2021). Avoid zoom fatigue, be present and learn. *NeuroRegulation*, *8*(1), 47–56. https://doi.org/10.15540/nr.8.1.47

Rajab, M. H., & Soheib, M. (2021). Privacy concerns over the use of webcams in online medical education during the COVID-19 pandemic. *Cureus*, *13*(2), e13536. https://doi.org/10.7759/cureus.13536

Rogers, E. M. (2003). *Diffusion of innovations*. Simon & Schuster.

Suggs, C., Myers, J., & Dennen, V. (2010). Raise your hand if you wanna speak: Navigating turn-taking in a Webex course. In J. Sanchez & K. Zhang (Eds.). *E-Learn: World Conference on E-Learning in Corporate, Government, Healthcare, and Higher Education* (pp. 2212–2219). AACE.

Torchia, R. (2021). The pros and cons of requiring students to turn on their cameras. *Ed Tech Magazine*, *7*. https://edtechmagazine.com/k12/article/2021/07/pros-and-cons-requiring-students-turn-their-cameras

Tu, C.-H. (2002). The relationship between social presence and online privacy. *The Internet and Higher Education*, *5*(4), 293–318. https://doi.org/https://doi.org/10.1016/S1096-7516(02)00134-3

Wiederhold, B. K. (2020). Connecting through technology during the Coronavirus Disease 2019 Pandemic: Avoiding "zoom fatigue." *Cyberpsychology Behavior and Social Networking*, *23*(7), 437–438. https://doi.org/10.1089/cyber.2020.29188.bkw

Will, P., Bischof, W. F., & Kingstone, A. (2020). The impact of classroom seating location and computer use on student academic performance. *PLOS ONE*, *15*(8), e0236131. https://doi.org/10.1371/journal.pone.0236131

Wolf, J. P. (2008). The effects of backchannels on fluency in L2 oral task production. *System*, *36*(2), 279–294. https://doi.org/https://doi.org/10.1016/j.system.2007.11.007

Xi, l., Yuan, Z., Yunqi, B., & Feng-Kuang, C. (2017). An investigation of university students' classroom seating choices. *Journal of Learning Spaces*, *6*(3). http://libjournal.uncg.edu/jls/article/view/1513

Yang, D., Olesova, L., & Richardson, J. C. (2010). Impact of cultural differences on students' participation, communication, and learning in an online environment. *Journal of Educational Computing Research*, *43*(2), 165–182. https://doi.org/10.2190/EC.43.2.b

Yarmand, M., Solyst, J., Klemmer, S., & Weibel, N. (2021, May 8–13). *"It feels like I am talking into a void": Understanding interaction gaps in synchronous online classrooms* [Conference presentation]. CHI Conference on Human Factors in Computing Systems, Yokohama, Japan.

Zhao, Y., Wang, N., Li, Y., Zhou, R., & Li, S. (2020). Do cultural differences affect users' e-learning adoption? A meta-analysis. *British Journal of Educational Technology*, *52*(1), 20–41. https://doi.org/10.1111/bjet.13002

Zhu, C., Valcke, M., & Schellens, T. (2009). Cultural differences in the perception of a social-constructivist e-learning environment. *British Journal of Educational Technology*, *40*(1), 164–168. https://doi.org/10.1111/j.1467-8535.2008.00879.x

Zomorodian, K., Parva, M., Ahrari, I., Tavana, S., Hemyari, C., Pakshir, K., Jafari, P., & Sahraian, A. (2012). The effect of seating preferences of the medical students on educational achievement. *Medical Education Online*, *17*. https://doi.org/10.3402/meo.v17i0.10448

Zydney, J. M., Warner, Z., & Angelone, L. (2020). Learning through experience: Using design based research to redesign protocols for blended synchronous learning environments. *Computers & Education*, *143*, 103678. https://doi.org/https://doi.org/10.1016/j.compedu.2019.103678

Appendix A

Survey Instrument: English/United States Version

Background information

Have you taken classes that use synchronous video (e.g., Zoom, MS Teams, Google Meet)?

- o   Yes
- o   No (NOTE: Tracked out if response is no)

Are you currently enrolled in school?

- o   I am currently enrolled
- o   I am not currently enrolled, but was during the 2020-21 school year
- o   I am not currently enrolled and was not enrolled during the 2020-21 school year (NOTE: Tracked out if response is selected)

Current GPA

- o   3.5-4.0
- o   3.0-3.49
- o   2.5-2.99
- o   2.0-2.49
- o   1.0-1.99
- o   Under 1.0
- o   Don't know
- o   Prefer to not share

In a face-to-face classroom, where are you most likely to sit?

- o   At the front of the room
- o   In the middle of the room
- o   In the back of the room

How often did you use synchronous tools like Zoom to meet with a class or other group of people prior to the COVID-19 pandemic?

- o   Daily
- o   4-6 times a week
- o   2-3 times a week
- o   Once a week or less frequently
- o   Never

How often did you use synchronous tools like Zoom to meet with a class or other group of people during the 2020-21 school year?

- o   Daily
- o   4-6 times a week
- o   2-3 times a week
- o   Once a week or less frequently
- o   Never

Factors influencing webcam use
My decision to turn on my webcam is influenced by (select all that apply):
- o How I am dressed/groomed
- o My surroundings
- o My degree of involvement in the class meeting
- o Number of people in the class meeting
- o Whether others have webcams on or off
- o My ability to give my full attention to the class meeting
- o Whether I want to talk during class
- o Whether I am prepared for class
- o Whether the class is being recorded
- o Whether it is required
- o My bandwidth speed
- o None of these items

Webcam and related synchronous learning behaviors and beliefs
Which of the following statements are TRUE for you in the online classroom? Select all that apply.
- o I learn better when my webcam is on.
- o I am more likely to prepare for class if I am required to keep my webcam on.
- o I am more likely to pay close attention in class if I am required to keep my webcam on.
- o I am more likely to speak in class if I am required to keep my webcam on.
- o I am likely to have private chat or text messages with classmates during class.
- o I prefer to watch class recordings rather than attend the live session.
- o I think students should be required to turn their webcams on during class lectures.
- o I think students should be required to turn their webcams on during class discussions.
- o I think students should be required to turn their webcams on in breakout groups.
- o None of these statements is true for me.

Multitasking
Please indicate your agreement with the following items about online classes taught via zoom or similar synchronous video tools:
[Answered using 5-point Likert scale; 1 = Strongly Disagree / 5 = Strongly Agree

- I multitask on my computer when in online classes (e.g., work within other windows)
- I multitask within my physical space when in online classes (e.g., knitting, cooking)
- I am less likely to multitask if my webcam is on
- I turn my webcam off if I need to multitask
- When my webcam is off, I am more likely to walk away from the class

Appendix B
Chi-square Test of Independence Results for Factors Affecting Students' Webcam Use

	Country			Seating Choice			Achievement		
	Pearson Chi-Square (df)	*p*	Cramer's V	Pearson Chi-Square (df)	*p*	Cramer's V	Pearson Chi-Square (df)	*p*	Cramer's V
How I am dressed/groomed	103.280 (2)	<.001	.212	13.755 (2)	<.01	.077	17.568 (2)	<.001	.091
My surroundings	38.997 (2)	<.001	.130	6.198 (2)	<.05	.052	5.520 (2)	.063	.051
My degree of involvement in the class meeting	207.322 (2)	<.001	.300	12.120 (2)	<.01	.073	7.269 (2)	<.05	.059
Number of people in the class meeting	114.485 (2)	<.001	.223	2.163 (2)	.339	.031	3.903 (2)	.142	.043
Whether others have webcams on or off	147.825 (2)	<.001	.254	17.444 (2)	<.001	.087	48.450 (2)	<.001	.152
My ability to give my full attention to the class meeting	139.062 (2)	<.001	.246	21.632 (2)	<.001	.097	1.208 (2)	.547	.024
Whether I want to talk during class	128.801 (2)	<.001	.237	5.318 (2)	.070	.048	.869 (2)	.648	.020
Whether I am prepared for class	114.872 (2)	<.001	.224	7.062 (2)	<.05	.055	1.741 (2)	.419	.029
Whether the class is being recorded	86.577 (2)	<.001	.194	.978 (2)	.613	.021	10.400 (2)	<.01	.070
Whether it is required	31.757 (2)	<.001	.118	11.506 (2)	<.01	.071	20.615 (2)	<.001	.099
None of these items	7.292 (2)	<.05	.056	1.151 (2)	.562	.022	4.943 (2)	.084	.049

Appendix C
Chi-square Test of Independence Results for SL Beliefs and Behaviors

	Country			Seating Choice			Achievement		
	Pearson Chi-Square (df)	*p*	Cramer's V	Pearson Chi-Square (df)	*p*	Cramer's V	Pearson Chi-Square (df)	*p*	Cramer's V
I learn better when my webcam is on.	34.580 (2)	<.001	.123	28.698 (2)	<.001	.112	4.147 (2)	.126	.044
I am more likely to prepare for class if I am required to keep my webcam on.	.546 (2)	.761	.015	5.602 (2)	.061	.049	.031 (2)	.984	.004
I am more likely to pay close attention in class if I am required to keep my webcam on.	62.392 (2)	<.001	.165	23.110 (2)	<.001	.100	5.099 (2)	.078	.049
I am more likely to speak in class if I am required to keep my webcam on.	90.674 (2)	<.001	.199	11.174 (2)	<.01	.070	9.996 (2)	<.01	.069
I am likely to have private chat or text messages with classmates during class.	108.787 (2)	<.001	.218	3.810 (2)	.149	.041	13.693 (2)	<.01	.081
I prefer to watch class recordings rather than attend the live session.	304.657 (2)	<.001	.364	57.070 (2)	<.001	.158	2.333 (2)	.311	.033
I think students should be required to turn their webcams on during class lectures.	3.687 (2)	.158	.040	12.422 (2)	<.01	.074	1.004 (2)	.605	.022
I think students should be required to turn their webcams on during class discussions.	67.536 (2)	<.001	.171	15.591 (2)	<.001	.082	8.845 (2)	.012	.065
I think students should be required to turn their webcams on in breakout groups.	91.874 (2)	<.001	.200	10.902 (2)	<.01	.069	15.445 (2)	<.001	.086
None of these statements is true for me.	300.352 (2)	<.001	.362	17.966 (2)	<.001	.088	.755 (2)	.686	.019

Appendix D
Chi-square Test of Independence Results for Multitasking Behaviors

	Country			Seating Choice			Achievement		
	Pearson Chi-Square (df)	*p*	Cramer's V	Pearson Chi-Square (df)	*p*	Cramer's V	Pearson Chi-Square (df)	*p*	Cramer's V
I multitask on my computer when in virtual classes (e.g., work within other windows).	592.406 (8)	<.001	.359	19.398 (8)	<.05	.065	26.013 (8)	<.01	.079
I multitask within my physical space when in virtual classes (e.g., knitting, cooking).	313.735 (8)	<.001	.261	27.423 (8)	<.01	.077	27.008 (8)	<.01	.080
I am less likely to multitask if my webcam is on.	153.741 (8)	<.001	.183	31.418 (8)	<.001	.083	30.687 (8)	<.001	.085
I turn my webcam off if I need to multitask.	292.408 (8)	<.001	.252	18.372 (8)	<.001	.063	27.386 (8)	<.01	.081
When my webcam is off, I am more likely to walk away from the class.	437.482 (8)	<.001	.309	31.853 (8)	<.001	.083	23.557 (8)	<.01	.075

How Online Learning Readiness Can Predict Online Learning Emotional States and Expected Academic Outcomes: Testing a Theoretically Based Mediation Model

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Abstract

During the pandemic, online courses became the major delivery format for most institutions of higher learning across the United States and around the world. However, many students experienced emotional distress as a result and have struggled to adapt to remote learning. To explore how emotional distress relates to other aspects of online learning, including online learning readiness and academic outcome, we asked a sample of 80 college students to participate in an online survey in the fall semester of 2020. Two distinct online learning readiness patterns were found using k-means cluster analysis. Online learning-ready learners showed statistically significant differences from the not-ready online learners on anxiety, boredom, and satisfaction. Moreover, a three-path mediation model based on a theoretical relationship between online learning readiness, emotional state, and expectation of learning outcome was tested using structural equation modeling (SEM). Results showed that readiness positively predicted satisfaction; furthermore, only satisfaction predicted learning expectation and expected grade. The implications of these findings and limitations of the study are discussed.

Keywords: online learning readiness, emotional states, mediation model, online learning outcome

Due to the COVID-19 pandemic that started to spread widely in the United States in March of 2020, approximately 300 U.S. universities transitioned from face-to-face to online learning (Foresman, 2020), with online courses soon becoming the major delivery format for most institutions of higher education across the country. However, not all students succeeded in online learning environments; many experienced emotional distress and struggled to adapt. Assuming online instruction will continue to play a major role in higher education, identifying whether students are prepared for online learning is a necessary first step to ensuring success for online learners.

A state of preparedness for learning (also known as readiness) is essential for performance excellence. This applies not only in an online learning environment (Hung et al., 2010), but improves the learning experience and outcomes regardless of course delivery format (i.e., online, or offline) (Hung et al., 2010; Watson, 1996). Preparations for learning include, but are not limited to, students reviewing or reading materials ahead of time and maintaining a positive attitude and motivation toward learning. Teachers can help students get ready for learning through in-class activities, dividing assigned materials into smaller blocks, and modifying the classroom-related environment (e.g., rearranging the furniture such as using long table or round table for more discussions in traditional educational setups).

However, in an online learning environment, learners inevitably bear most of these responsibilities on their own, such as proactively creating a proper environment for online course since there is no physical classroom and the students may change their study environment from campus to home. Therefore, online learning readiness consists not only of the more traditional aspects of learning readiness but also additional aspects such as the learning environment. Even though the relations between online learning readiness and related learning aspects such as emotional status and academic outcome have been examined previously, no study to date has looked at all these different aspects simultaneously (Hung et al., 2010; Martin et al., 2020; Wang et al., 2022; Zhu et al., 2022). To fill this gap, in the current study, we first examined potential underlying subgroups of learners based on their profile of online learning readiness, followed by a mediation model addressing how online readiness predicted the expected grade through both emotional states and academic expectation. The goal of the study was to gain a more complete picture of the online learning mechanism from the perspective of online learning readiness.

Review of the Related Literature

Online Learning Readiness

Several online learning readiness scales have been used in previous research. For example, Hung and her colleagues (2010) included five dimensions of learning preparedness in their Online Learning Readiness Scale (OLRS): self-directed learning, motivation for learning, computer/internet self-efficacy, learner control, and online communication self-efficacy. Briefly, *self-directed learning* measures learners' control of their learning process. For example, self-directed learners can carry out their study plan independently. *Motivation for learning* measures whether students are motivated to learn. *Computer/internet self-efficacy*, in turn, addresses self-efficacy in terms of accessing online learning platforms and managing IT equipment. *Learner control* assesses the level of control with which students decide what, when, where, and how to learn. Finally, *online communication self-efficacy* refers to a special type of ability to communicate with instructors or classmates that is required

in online settings since teachers and classmates are rarely reachable in person in a virtual classroom setting. Through these subscales, the OLRS allows learners to evaluate their state of readiness for online courses. In particular, the last three subscales are directly related to online learning scenarios. Nonetheless, this scale does not address how attentions or course materials may relate to readiness.

Martin et al. (2020) summarized the existing online student readiness survey instruments (e.g., Bernard et al., 2004; Kerr et al., 2006; Mattice & Dixon, 1999; Zimmerman & Kulikowich, 2016) and created their own self-assessment instrument. Specifically, based on a Google search, they identified four domains (online student attributes, time management, communication, and technical) that are related to the competencies of student readiness for online learning.

In another effort to develop an online learning readiness tool, Yu and Richardson (2015) created 20 self-reported items to make up their Student Online Learning Readiness (SOLR) instrument focusing on four components—social competencies with the instructor, communication competencies, social competencies with classmates, and technical competencies. In a subsequent study, Yu (2018) examined the construct validity of the SOLR, confirming that the instrument can be useful for measuring students' level of readiness for online learning before they take an online course. In addition, Liu (2019) evaluated the effects of an online learning orientation course on SOLR with a single-group pre- and post-test design. The results supported the use of SOLR for evaluation and planning for online student support.

As illustrated, most of the existing online readiness instruments focus only on specific learner competencies (e.g., technical competencies and social competencies) (Hung et al., 2010; Yu & Richardson, 2015). Yet, the requirements for being ready to learn in an online environment include a wide variety of factors such as the format (e.g., synchronized vs. asynchronized delivery format) and the content of online courses (Zheng et al., 2020). Moreover, until recently (Chien et al., 2020), there was no online learning readiness instrument created by using machine learning techniques. Chien and colleagues (2020) adopted a machine learning approach to first exclude the online readiness items that are not directly related to learning outcome and for those retained items which could be further categorized as students' behaviors and attitudes related into four dimensions through factor analysis. These four dimensions (and the corresponding subscales)—perceived attention problems under the online learning environment, environmental structuring, independent learning, and perceived unattractive course materials—make up the foundation of their Online-learning REadiness Scale (ORES; Chien et al., 2020). The details of these dimensions are discussed below, and the corresponding constructs are presented in the hypothesized model shown in Figure 1.

Due to the many potential distractions (e.g., social media notification) in the online learning environment, the ability to identify issues related to inattention is an essential part of preparing for successful online learning. Additionally, online learners need to prepare their own learning environment since there is no physical classroom; indeed, creating a supportive learning environment has been found to improve distance education and online learning performance (Ng, 2021). To that end, the ORES subscale of environmental structuring measures how well the learning environment is prepared. Given that online students need to play an active role in their own learning (e.g., proactively arrange their study schedule and hours rather following whatever the school determines), they must be self-regulated and independent to succeed (Carter et al., 2020). Hence, items that measure self-regulation and

independence are important parts of the readiness construct. The fourth subscale perceived boring/uninteresting course materials, measures students' perspective on the course materials whether they are provided in a dull way. Although determining the attractiveness of course materials can be subjective and vary widely across learners, online learners generally agree that unattractive course materials make them "feel bored." (Ding & Zhao, 2020) In other words, students' emotional status is likely related both to the course content and their overall readiness to online learning.

Given the newly developed ORES (Chien et al., 2020), it is of interest to examine any possible underlying subgroups of learners displaying different patterns of online learning readiness. Such an exploratory analysis will provide a better idea of the readiness profiles of online learners, especially those who are struggling with the online learning environment, so that more effective interventions can be developed to help this group of learners succeed.

Emotional Status During Online Learning

Students' psychological perspective on their readiness is an important factor and is directly related to their performance in the online learning environment. Moreover, students' emotional status must be taken into consideration because it is not only linked with their cognitive ability but also their learning performance, which can be fostered or hindered by emotional experiences (Dirkx, 2008; Lehman, 2006; Pekrun et al., 2011).

In traditional learning environments, several studies have found that positive emotions such as enjoyment positively predicted student effort and academic performance, whereas negative emotions such as anxiety and boredom negatively predicted academic attainment and, overall, were more associated with lower levels of performance (Pekrun et al., 2009, 2011). When transitioning from a traditional face-to-face to an online learning environment, negative emotions such as anxiety and distress can be triggered due to the unfamiliar learning environment or limited social exchange. St. Clair (2015) stressed the anxiety problems of online learners, especially first-time online students. Similarly, Butz et al. (2015) found that online learners exhibited significantly higher levels of technology-related fear, anger, and helplessness than students in traditional classes. Furthermore, according to Hara and Kling (2000) and Abdous (2019), frustration, isolation, anxiety, and confusion are the most frequent feelings experienced by learners in online learning environments. Finally, compared with face-to-face courses, students might feel less satisfied with online courses (Tratnik et al., 2019).

Academic Expectations and Their Relation to Emotional Status in Online Learning

Expectation can directly motivate behaviors (Wigfield & Eccles, 2000). At the same time, different forms (i.e., positive and negative) of emotional status can predict the level of expectation. Indeed, the three emotional variables—anxiety, boredom, and satisfaction—studied here are related to students' academic expectation. Anxiety and boredom often result from inaccurate expectation of course difficulty (Csikszentmihalyi, 1990). That is, learners are likely to feel anxiety when the course difficulty is higher than they expect. On the contrary, learners can reach a state of boredom if the course content is easier than expected. Course satisfaction usually relates to the learner's expectation of the course quality as well as the actual learning experience. Thus, academic expectation was hypothesized to serve as a mediator in the relation between emotional status and expected grade.

In sum, academic emotions play a critical role in the overall learning processes; yet the relationship between students' online learning readiness and their emotional experiences in the

online learning environment has not been thoroughly examined. In addition, knowledge about how students' emotional status is related to their expected academic achievement in the online learningenvironment remains limited. Therefore, the purpose of this study was to investigate the role of college students' online learning readiness in the online learning process and how it predicted their emotional states (e.g., anxiety, boredom, and satisfaction) and academic expectations, which, in turn, predicted their final expected grade. The hypothesized model as presented in Figure 1 is a full mediation model with online learning readiness as the exogenous variable, along with different emotional states and academic expectation as the mediators. Expected grade served as the target outcome variable.

The specific research questions were as follows:
> H1: How many potential subgroups of online learners could be found based on the online learning readiness profile?
> H2: Does online learning readiness predict the three emotional states (i.e., anxiety, boredom, and satisfaction)?
> H3: Do the three emotional states (i.e., anxiety, boredom, and satisfaction) further predict students' academic expectation?
> H4: Do the three emotional states (i.e., anxiety, boredom, and satisfaction) fully mediate the relation between online learning readiness and academic expectation?

Method

Participants and Procedure

Data were collected during the fall semester of 2020 on students recruited from a large public university in Texas. A recruitment email with the online survey link created by Qualtrics was sent to students by several academic advisors and instructors who were teaching large sections of undergraduate and graduate-level courses. Students who had enrolled in at least one synchronous or asynchronous onlinecourse were invited to participate. Students who consented to participate and completed the survey were rewarded with a $10 gift card. We estimated that the recruitment email reached roughly 1,000 students, of whom 106 clicked the survey link. The final sample consisted of 80 students, who completed the survey (63 females, 17 males). Of these 80 students, 58 were undergraduate and 22 were graduate students.

Measures
Online-Learning Readiness Scale (ORES)

We adopted a multifaceted 14-item ORES developed by Chien and colleagues (2020) to measure online learners' psychological readiness. A confirmatory factor analysis (CFA) entrenched four subscales: perceived attention problems under the online learning environment, environmental structuring, independent learning, and perceived unattractive course materials. *Perceived attention problems under the online learning environment* addressed readiness of focus on the course. For example, "When I see or hear notifications from social media (e.g., Twitter, Instagram, Facebook), I cannot wait to check them." Answers were given along a 5-point scale from 1 (not at all like me) to 5 (very much like me). *Environmental structuring* addressed the setting of the learning environment, including questions like "I choose the location where I study for this online course to avoid too much distraction." Answers were given along a 7-point scale from 1 (not at all true for me) to 7

(very true for me). *Independent learning* assessed whether the learner was ready to learn independently, ranging from 1 (strongly disagree) to 5 (strongly agree) (example question: "I am capable of solving problems alone"). Finally, *perceived unattractive course materials* addressed the learner's perspective of the course materials, for instance, "The design of this online class looks dry and unappealing." Answers were given along a 5-point scale ranging from 5 (very true) to 1 (not true). ω total was used to check the reliability of the instrument (McDonald, 1999). In this four-factor measurement, ω total for the total score was 0.78; the ω total for each subscale was 0.65, 0.64, 0.52, and 0.79, respectively.

Online Learning Anxiety

We also developed an eight-item online learning anxiety scale to assess the degree to which students felt anxious towards the online learning environment. Anxiety surrounding unfamiliar learning gadgets in an online learning scenario was added to the original learning anxiety; therefore, the scale included the dimensions of "Anxiety Due to Lack of Guidelines and Technical Knowledge for the Online Course" and "Anxiety Due to Lack of Academic Confidence in Their Ability for the Online Course." An example question from the former subscale was "A lack of clear instructions and/or feedback from the instructor in this online course would challenge me." An example question from the latter subscale was "I feel an inability to manage this online course workload." Answers were given along a 5-point scale ranging from 1 (strongly disagree) to 5 (strongly agree). Reliability coefficients (Cronbach's α) for the two subscales were .72 and .86, respectively.

Shortened Boredom Proneness Scale (SBPS)

The shortened eight-item SBPS was adapted by Struk et al. (2017) from the original Boredom Proneness Scale (BPS) developed by Farmer and Sundberg (1986). The SBPS has demonstrated unidimensionality and was used to assess propensity to experience boredom. For example, "Many things I have to do are repetitive and monotonous." Answers were given along a 7-point scale ranging from 1 (strongly disagree) to 7 (strongly agree). A high score on this scale reflects a high propensity to feeling bored. The reliability coefficient (Cronbach's α) of the scale was .83.

Online Course Satisfaction Scale (OCSS)

The seven items of the OCSS (Wei & Chou, 2020) were adopted to assess students' general level of contentment with the learning experience related both to instructors and course design. For instance, "I am satisfied with the instructional style." Besides the different aspects of satisfaction, a summary question, "Overall, I am satisfied with this course," was asked at the end of the scale. Answers were given along a 5-point scale ranging from 1 (strongly disagree) to 5 (strongly agree). The reliability coefficient (Cronbach's α) of the scale was .84.

Academic Expectations

The academic expectations scale (Chemers et al., 2001) was used to assess students' expression of their expectations for future academic performance in their online course, including performance in courses, getting good evaluations, meeting academic goals, and generally performing well academically. Answers were given on a 5-point scale ranging from 1 (strongly disagree) to 5 (strongly agree). The scale's reliability coefficient (ω total) was .66.

Expected Grade

Students' expected grade (A or non-A) consisted of their expected academic outcome for the online course they were taking.

Data Analysis Procedures
K-Means Clustering

K-means clustering is a multivariate person-centered exploratory approach that separates individuals into underlying subgroups based on a profile of a set of variables (Hartigan & Wong, 1979). This study applied k-means clustering to discover possible learner types in the data. K-means is an unsupervised learning algorithm that divides people (i.e., students/online learners in our data) with similar characteristics into groups (or clusters) without any preexisting grouping labels. With a chosen number of clusters and profile variables, k-means algorithm minimizes the intra-cluster variance that would divide data into the most distinct groups by calculating within cluster sum of square iteratively.

The number of clusters and initial points is essential to k-means clustering and determines the final cluster solution. Several methods assisted the researchers in deciding on the number of clusters, such as the elbow method, silhouette analysis, Davies-Bouldin index, and cubic clustering criterion (Davies & Bouldin, 1979; Ketchen & Shook, 1996; Kodinariya & Makwana, 2013; Sarle, 1983). Given that the students' readiness was the major focus of the study, we used the four ORES subscales as the clustering profile variables. The final group profile helped us to understand the characteristic of each subgroup.

Independent Sample *t*-Tests with External Variables

After obtaining the subgroups from the k-means clustering analysis, we investigated the group difference using independent *t*-tests with a set of external variables (i.e., variables not included in the k-means clustering). Three emotional variables—anxiety, boredom, and satisfaction—served as the external variables. The independent *t*-tests were carried out to compare the mean score difference between the groups on these three emotional variables.

Testing the Hypothesized Model via Structural Equation Modeling (SEM)

Structure equation modeling (SEM; Kline, 2016) was applied to estimate our hypothesized model, as shown in Figure 1. There are several advantages to using SEM. First, it estimates all the paths simultaneously (MacKinnon, & Luecken, 2008), unlike the multiple-regression approach (Baron & Kenny, 1986). Since SEM allows multiple endogenous variables in a model, a multiple-mediator model is possible. In the hypothesis model, three emotional variables—anxiety, boredom, and satisfaction—provided three possible mediation paths. Academic expectation served as a mediator between emotional status and the outcome variable, expected grade. SEM was the preferable estimation method due to the complicity of this model. Mplus (V8.6; Muthén & Muthén, 1998–2017) was used for the analysis.

Second, SEM provides model fit indices, another benefit of this type of analysis. Fit information offers evidence of whether the hypothesis model is approaching the data. Goodness of fit was evaluated by chi-squared test, RMSEA, CFI, and SRMR.

Results

To identify potential subgroups based on the four ORES subscales, we applied the k-means clustering procedure in RStudio (RStudio Team, 2015) with R-4.0.2 (R Core Team, 2020). Moreover, we compared multi-cluster solutions to find a suitable number of clusters using the cubic clustering criterion (CCC) under the NbClust Package (Charrad et al., 2014).

Figure 1
Cluster results of Online-Learning Readiness Scale (ORES)
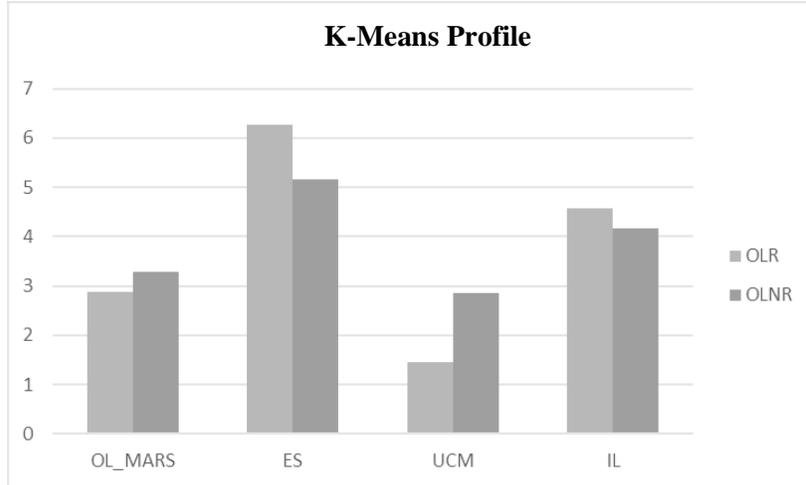
Note. OL_MARS = perceived attention problems under the online learning environment; ES = environmental structuring; UCM = perceived unattractive course materials; IL = independent learning; OLR = Online-Learning Ready (OLR) Learners; OLNR = Online-Learning Non-Ready (OLNR) Learners.

As illustrated in Figure 1, this led to a two-cluster solution, with Cluster #1 ($N = 44$), named the Online-Learning Ready (OLR) Learners, reporting higher scores on both environmental structuring and independent learning and lower scores on both perceived unattractive course materials and attention problems under the online learning environment. By comparison, students in Cluster #2 ($N = 36$) scored in the opposite direction on the four ORES subscales; that is, they reported higher scores on both perceived unattractive course materials and attention problems under the online learning environment and lower scores on both environmental structuring and independent learning. Based on that profile, students in Cluster #2 were named the Online-Learning Not-Ready (OLNR) Learners. In addition, as shown in Table 1, significant mean differences on three emotional states (anxiety, boredom, and satisfaction) during online learning were found between the two groups: the OLR Learners had statistically significant lower anxiety ($t = -2.53$, $p < .05$) and boredom ($t = -4.40$, $p < .001$) scores and higher satisfaction scores ($t = 4.94$, $p < .001$) than the OLNR Learners.

A hypothesized three-path mediation model for how students' online learning readiness predicted their online learning emotions and performance was also tested using SEM. Specifically, we tested the potential mediation mechanisms of participants' emotional states during online learning (i.e., anxiety, boredom, and satisfaction) and academic expectations

based on whether online readiness predicted the final expected grade in an online learning environment.

Table 1
Mean Values of the Emotional Factors During the Online Classes Across ORES Profile

	C1: Online-Learning Ready (OLR) Learners ($N = 44$)		C2: Online-Learning Non-Ready (OLNR) Learners ($N = 36$)		*t*-test
	M	*SD*	*M*	*SD*	
Anxiety	2.21	.88	2.73	.95	-2.53*
Boredom	2.52	1.09	3.58	1.05	-4.40***
Satisfaction	4.10	.65	3.39	.63	4.94***

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

As shown in Figure 2, the OLR Learners with higher online learning readiness scores had lower online anxiety ($\beta = -.28$, $p < .01$) and boredom ($\beta = -.45$, $p < .001$) but higher satisfaction scores ($\beta = .49$, $p < .001$) than the OLNR Learners. Furthermore, neither anxiety nor boredom significantly predicted academic expectations for all participants regardless of their readiness status ($\beta = -.24$, $p > .05$ and $\beta = .14$, $p > .05$, respectively). Only satisfaction significantly and positively predicted academic expectations ($\beta = .44$, $p < .01$), which, in turn, significantly and positively predicted the final expected grade ($\beta = .63$, $p < .001$). The overall mediated effect ($\hat{\alpha}\beta\gamma$) was examined using the bootstrap method (Cheung, 2007); the 95% confidence interval of the mediated effect fell between .07 and .64, which did not include zero, indicating that the overall mediated effect was significant. Therefore, both satisfaction and academic expectations were significant mediators.

Figure 2
Hypothesized Mediation Model
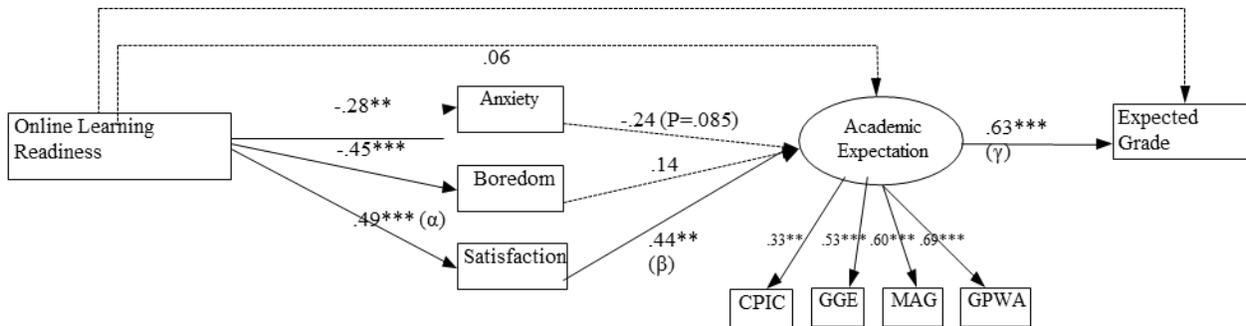
χ^2 (23, $N = 80$) = 31.689 ($p = .107$), RMSEA = .07, CFI = .91, and WRMR = .84

Note. All the coefficients are standardized. Dashed lines represent no significant association. CPIC = concerning performance in courses; GGE = getting good evaluations; MAG = meeting academic goals; GPWA = generally performing well academically.
**$p < .01$. ***$p < .001$.

Discussion

Prior researchers have explored partial relations among online learners' readiness, emotion state, academic expectation, and learning outcome (e.g., Hung et al., 2010; Martin et al., 2020; Wang et al., 2022; Zhu et al., 2022). The present study took a further step by putting together a theory-driven hypothesized model that incorporated several important aspects of online learning, including online learning readiness, different emotional states during online learning, learning expectations, and the expected learning outcome. Our goal was to gain a more complete picture of the online learning mechanism through the online learning readiness and related aspects. Two types of online readiness learners were found. Also, a fully mediated effect from readiness to learning outcome through the level of learning satisfaction and academic expectations was found.

Through cluster analysis, we identified two types of online learner profiles via the ORES: TheOnline-Learning Ready (OLR) Learners and the Online-Learning Not-Ready (OLNR) Learners. Group membership exhibited mean differences in anxiety, boredom, and satisfaction when participating in online courses. Specifically, the OLR Learners felt lower anxiety and boredom but higher satisfaction than the OLNR Learners.

These findings are similar to those of previous research. For example, when transitioning from a familiar face-to-face to an online learning environment that lacks a clear course roadmap of where to start or what to do, inexperienced or unprepared online learners tend to feel anxious or fear failure regarding their abilityto succeed in the unfamiliar learning environment (Ajmal & Ahmad, 2019; Zembylas, 2008). Further, Heckel and Ringeisen (2017) concluded that believing in their ability to handle the technology and content of online-learning platforms enhances the subjective relevance students attach to online learning, which, in turn, predicts lower boredom. Topal (2016) found that there was a positive significant relationship between students' levels of readiness and their satisfaction with e-courses.

In addition, SEM analysis in the present study found that OLR Learners with higher online learning readiness tended to feel less anxiety and boredom with their online courses and were more likely to report course satisfaction than the OLNR Learners. Moreover, anxiety and boredom did not significantly predict academic expectations; only satisfaction significantly and positively predicted academic expectations, which, in turn, led to higher grade expectations.

Consistent with previous studies, negative learning emotions are likely to impede students' learning (Tempelaar et al., 2012), whether in online or traditional courses. For example, for students entering college confident in their ability to perform well academically, their positive expectancy predicted better reactions during transitions to new academic environments (Chemers et al., 2001). Similarly, You and Kang (2014) found that while online learners' emotions of fear and boredom did not significantly influence self-regulated learning, feelings of enjoyment fostered self-regulated learning.

The major implication of our findings is that it is important to understand students' online readiness before they start taking online courses, especially for students who are new to the online learning environment. Thus, as needed, educators and policymakers can provide more support to improve students' positive emotion and satisfaction level such as offering compliments and incentives when students meet learning targets goals, which will likely lead to more positive expectations and higher expected performance.

A few limitations of the study warrant mention. First, self-reported expected grades instead of actual grades were used as the outcome measure. Clearly, while this is not ideal as

the expected grade may be different from the actual grade, nevertheless, previous studies (Yeh et al., 2019) have found that the correlation between expected and actual grades was quite high. The second limitation involves the cross-sectional nature of the study. Our data provide a snapshot of students' emotional states (feelings of anxiety, boredom, and satisfaction). Future research should track individual students' emotional states over time. That is, a longitudinal study would provide a better understanding of the potential causal influences among the study variables over time, and an in-depth understanding of how students' readiness and feelings evolve can inform future online course design and support.

Further, the emotion state is a dynamic variable that changes throughout the course. Therefore, future studies should monitor the emotion state over time. A longitudinal study would provide more information about how emotion state can predict student's learning outcome. Another possible future study might categorize learners' latent group and profile to learn more about different types of readiness and how instructors can best instill them in students.

Lastly, the nature of the online course (e.g., a well-developed online course or an ad-hoc remote learning course due to COVID-19; synchronized or asynchronized) in which participants were enrolled was not obtained. Determining that might have some underlying confounding effect on study findings and, therefore, should also be examined in future studies.

Declarations
The authors declared no conflicts of interest.

All procedures performed in studies involving human participants were in accordance with the ethical standards and approval of Texas A&M University, USA.

Informed consent was obtained from all individual participants included in the study.

References

Abdous, M. H. (2019). Influence of satisfaction and preparedness on online students' feelings of anxiety. *The Internet and Higher Education*, *41*, 34–44.

Ajmal, M., & Ahmad, S. (2019). Exploration of anxiety factors among students of distance learning: A case study of Allama Iqbal Open University. *Bulletin of Education and Research, 41*(2), 67–78.

Allen, M., Bourhis, J., Burrell, N., & Mabry, E. (2002). Comparing student satisfaction with distance education to traditional classrooms in higher education: A meta-analysis. *American Journal of Distance Education, 16*(2), 83–97. doi:10.1207/S15389286AJDE1602_3

Baron, R. M., & Kenny, D. A. (1986). The moderator-mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations. *Journal of Personality and Social Psychology*, *51*(6), 1173–82. doi:10.1037/0022-3514.51.6.1173

Beaunoyer, E., Dupéré, S., & Guitton, M. J. (2020). COVID-19 and digital inequalities: Reciprocal impacts and mitigation strategies. *Computers in Human Behavior*, *111*(6), 106424. doi:10.1016/j.chb.2020.106424

Bernard, R. M., Brauer, A., Abrami, P. C., & Surkes, M. (2004). The development of a questionnaire for predicting online learning achievement. *Distance Education, 25*(1), 31–47. doi:10.1080/0158791042000212440

Butz, N. T., Stupnisky, R. H., & Pekrun, R. (2015). Students' emotions for achievement and technology use in synchronous hybrid graduate programmes: A control-value approach.*Research in Learning Technology, 23*, 26097. doi:10.3402/rlt.v23.26097

Carter, Jr., R. A., Rice, M., Yang, S., & Jackson, H. A. (2020). Self-regulated learning in online learning environments: Strategies for remote learning. *Information and Learning Sciences*, Vol. 121 No. 5/6, pp. 321-329. https://doi.org/10.1108/ILS-04-2020-0114

Charrad, M., Ghazzali, N., Boiteau, V., & Niknafs, A. (2014). NbClust: An R package for determining the relevant number of clusters in a data set. *Journal of Statistical Software,61*(6), 1–36. doi:10.18637/jss.v061.i06

Chemers, M. M., Hu, L., & Garcia, B. F. (2001). Academic self-efficacy and first-year college student performance and adjustment. *Journal of Educational Psychology, 93*(1), 55–64.

Cheung, M. W. L. (2007). Comparison of approaches to constructing confidence intervals for mediating effects using structural equation models. *Structural Equation Modeling: A Multidisciplinary Journal, 14*(2), 227–246. doi:10.1037/0022-0663.93.1.55

Chien, H. Y., Kwok, O. M., Yeh, Y. C., Sweany, N. W., Baek, E., & McIntosh, W. (2020). Identifying at-risk online learners by psychological variables using machine learning techniques. *Online Learning*, *24*(4), 131–146. doi: 10.24059/olj.v24i4.2320

Csikszentmihalyi, M. (1990). *Flow: The psychology of optimal experience* (vol. 1990). Harper & Row. doi: 10.2307/1511458

Davies, D. L., & Bouldin, D. W. (1979). A cluster separation measure. *IEEE Transactions on Pattern Analysis and Machine Intelligence*, *2*, 224–227. doi:10.1109/TPAMI.1979.4766909

Ding, Y., & Zhao, T. (2020). Emotions, engagement, and self-perceived achievement in a small private online course. *Journal of Computer Assisted Learning*, *36*(4), 449–457. doi:10.1111/jcal.12410

Dirkx, C. (2008). The meaning and role of emotions in adult learning. *New Directions for Adult and Continuing Education, 120*, 7–18. doi:10.1002/ace.311

Farmer, R., & Sundberg, N. D. (1986). Boredom proneness—The development and correlates ofa new scale. *Journal of Personality Assessment, 50*, 4–17. doi:10.1207/s15327752jpa5001_2

Foresman, B. (2020, March 24). *Here are the U.S. universities that have closed due to coronavirus.* https://edscoop.com/universities-closed-due-coronavirus-2020/

Hara, N., & Kling, R. (2000). Students' distress with a web-based distance education course. *Information, Communication and Society, 3*(4), 557–579. doi:10.1080/13691180010002297

Hartigan, J. A., & Wong, M. A. (1979). Algorithm AS 136: A k-means clustering algorithm. *Journal of the Royal Statistical Society. Series C (Applied Statistics)*, *28*(1), 100–108.

Heckel, C., & Ringeisen, T. (2017). Enjoyment and boredom in academic online-learning: Relations with appraisals and learning outcomes. In K. Moore & P. Buchwald (Eds.), *Stressand anxiety: Coping and resilience* (pp. 127–136). Logos.

Hung, M. L., Chou, C., Chen, C. H., & Own, Z. Y. (2010). Learner readiness for online learning: Scale development and student perceptions. *Computers & Education*, *55*(3), 1080–1090. doi:10.1016/j.compedu.2010.05.004

Kerr, M. S., Rynearson, K., & Kerr, M. C. (2006). Student characteristics for online learning success. *Internet and Higher Education, 9*, 91–105. doi:10.1016/j.iheduc.2006.03.002

Ketchen, D. J., & Shook, C. L. (1996). The application of cluster analysis in strategic management research: An analysis and critique. *Strategic Management Journal*, *17*(6), 441–458. doi:10.1002/(SICI)1097-0266(199606)17:6<441::AID-SMJ819>3.0.CO;2-G

Kline, R. B. (2016). *Principles and practice of structural equation modeling* (4th ed). Guilford Publications.

Kodinariya, T. M., & Makwana, P. R. (2013). Review on determining number of cluster in k-means clustering. *International Journal of Advance Research in Computer Science and Management Studies*, *1*(6), 90–95.

Lehman, R. (2006). The role of emotion in creating instructor and learner presence in the distance education experience. *Journal of Cognitive Affective Learning, 2*(2), 12–26.

Liu, J. C. (2019). Evaluating online learning orientation design with a readiness scale. *Online Learning, 23*(4), 42–61. doi:10.24059/olj.v23i4.2078

MacKinnon, D. P., & Luecken, L. J. (2008). How and for whom? Mediation and moderation in health psychology. *Health Psychology*, *27*(2S), S99. doi:10.1037/0278-6133.27.2(suppl.).s99

Martin, F., Stamper, B., & Flowers, C. (2020). Examining student perception of their readiness for online learning: Importance and confidence. *Online Learning, 24*(2), 38–58. doi:10.24059/olj.v24i2.2053

Mattice, N. J., & Dixon, P. (1999). *Student preparedness for distance education* (ED 436 216). College of the Canyons.

McDonald, R. P. (1999). *Test theory: A unified treatment*. Erlbaum.

Muthén, L. K., & Muthén, B. O. (1998–2017). *Mplus user's guide. Eighth edition.* Muthén & Muthén.

Ng, C. F. (2021). The physical learning environment of online distance learners in higher education—A conceptual model. *Frontiers in Psychology, 12,* 635117. doi:10.3389/fpsyg.2021.635117

Pekrun, R., Elliot, A. J., & Maier, M. A. (2009). Achievement goals and achievement emotions:Testing a model of their joint relations with academic performance. *Journal of EducationalPsychology, 101*, 115–135. doi:10.1037/a0013383

Pekrun, R., Goetz, T., Frenzel, A. C., Barchfeld, P., & Perry, R. P. (2011). Measuring emotions instudents' learning and performance: The Achievement Emotions Questionnaire (AEQ). *Contemporary Educational Psychology, 36*, 36–48. doi:10.1016/j.cedpsych.2010.10.002

R Core Team. (2020). *R: A language and environment for statistical computing*. R Foundationfor Statistical Computing. https://www.R-project.org/

RStudio Team. (2015). *RStudio: Integrated development for R.* RStudio, Inc. http://www.rstudio.com/

Sarle, W. S. (1983). *Cubic clustering criterion*. SAS institute.

St. Clair, D. (2015). A simple suggestion for reducing first-time online student anxiety. *Journal of Online Learning and Teaching*, *11*(1), 129.

Struk, A. A., Carriere, J. S., Cheyne, J. A., & Danckert, J. (2017). A short boredom pronenessscale: Development and psychometric properties. *Assessment, 24*(3), 346–359. doi:10.1177/1073191115609996

Tempelaar, D. T., Niculescu, A., Rienties, B., Gijselaers, W. H., & Giesbers, B. (2012). Howachievement emotions impact students' decisions for online learning, and what precedes those emotions. *The Internet and Higher Education, 15*(3), 161–169. doi:10.1016/j.iheduc.2011.10.003

Topal, A. D. (2016). Examination of university students' level of satisfaction and readiness for e-courses and the relationship between them. *European Journal of Contemporary Education*, *15*(1), 7–23. doi:10.13187/ejced.2016.15.7

Tratnik, A., Urh, M., & Jereb, E. (2019). Student satisfaction with an online and a face-to-facebusiness English course in a higher education context. *Innovations in Education and Teaching International*, *56*(1), 36–45. doi:10.1080/14703297.2017.1374875

Wang, Y., Xia, M., Guo, W., Xu, F., & Zhao, Y. (2022). Academic performance under COVID-19: The role of online learning readiness and emotional competence. *Current Psychology*, 1–14. doi:10.1007/s12144-022-02699-7

Watson, R. (1996). Rethinking readiness for learning. In D. R. Olson & N. Torrance (Eds.), *The handbook of education and human development* (pp. 148–173). Wiley. doi:10.1111/b.9780631211860.1998.00009.x

Wei, H.-C., & Chou, C. (2020). Online learning performance and satisfaction: Do perceptionsand readiness matter? *Distance Education, 41*(1), 48–69. doi:10.1080/01587919.2020.1724768

Wigfield, A., & Eccles, J. S. (2000). Expectancy-value theory of achievement motivation. *Contemporary Educational Psychology*, *25*(1), 68–81.

Yeh, Y. C., Kwok, O. M., Chien, H. Y., Sweany, N. W., Baek, E., & McIntosh, W. A. (2019). How college students' achievement goal orientations predict their expected online learning outcome: The mediation roles of self-regulated learning strategies and supportive online learning behaviors. *Online Learning*, *23*(4), 23–41. doi:10.24059/olj.v23i4.2076

You, J. W., & Kang, M. (2014). The role of academic emotions in the relationship between perceived academic control and self-regulated learning in online learning. *Computers &Education, 77*, 125–133. doi:10.1016/j.compedu.2014.04.018

Yu, T. (2018). Examining construct validity of the Student Online Learning Readiness (SOLR) instrument using confirmatory factor analysis. *Online Learning, 22*(4), 277–288. doi:10.24059/olj.v22i4.1297

Yu, T., & Richardson, J. C. (2015). An exploratory factor analysis and reliability analysis of the Student Online-Learning Readiness (SOLR) instrument. *Online Learning, 19*(5), 120–141.doi:10.24059/olj.v19i5.593

Zembylas, M. (2008). Adult learners' emotions in online learning. *Distance Education, 29*(1),71–87. doi:10.1080/01587910802004852

Zheng, B., Lin, C. H., & Kwon, J. B. (2020). The impact of learner-, instructor-, and course-level factors on online learning. *Computers & Education*, *150*, 103851. doi: 10.1016/j.compedu.2020.103851

Zhu, Y., Xu, S., Wang, W., Zhang, L., Liu, D., Liu, Z., & Xu, Y. (2022). The impact of Online and Offline Learning motivation on learning performance: the mediating role of positive academic emotion. *Education and Information Technologies*, 1–18. doi: 10.1007/s10639-022-10961-5

Zimmerman, W. A., & Kulikowich, J. M. (2016). Online learning self-efficacy in students with and without online learning experience. *American Journal of Distance Education, 30*(3), 180–191. doi:10.1080/08923647.2016.1193801

What Does It Mean to Take Online Classes as an International Student During COVID-19?

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Abstract

Using the Theory of Social Support and the Community of Inquiry as theoretical frameworks, this qualitative study explored international students' experiences, challenges, and perceptions of online learning environments during the COVID-19 pandemic in the United States. By conducting three virtual focus group interviews with 18 international students, we identified four key themes that encapsulate participants' challenges and experiences of online learning: social isolation in online learning spaces, difficulties with engaging in online class discussions and activities, limited opportunities for improving English proficiency in the online setting and limited academic support from faculty and advisors. Implications for research and practice to support international students are discussed.

Keywords: Online learning, international students, COVID-19, online learning space, qualitative inquiry

Since the World Health Organization (WHO) declared COVID-19 a pandemic on March 11, 2020 (WHO, 2020), everyone in the world has experienced dramatic changes in their life and has been forced to adopt a new set of practices, without exception. According to WHO, through April 2021 the cumulative total of COVID cases soared to almost 150 million worldwide, with more than 3 million deaths. In the United States alone, there had been more than 30 million infections by the end of April 2021, and more than a half-million deaths (CDC, 2021). While people's knowledge, perceptions, attitudes, and practices regarding COVID-19 have been examined to help battle this novel disease (Alzoubi et al., 2020; Lai et al., 2020; Taghrir et al., 2020), the impact of COVID-19 on education has become the top concern for educators around the world. Dramatic overnight changes have forced all educators to make rapid-fire shifts to delivering courses online regardless of the subject matter. Teachers, faculty, students, and institutions all had to respond quickly to teaching and learning 100% remotely and mostly online; pedagogy had to be reconsidered to ensure effective online course design and delivery; and institutions had to find ways to provide adequate support (e.g., digital access) to all and maintain well-being among all faculty and their students (Bessett, 2020).

At such an unprecedented time, international students faced unique challenges and additional difficulties. They must face the reality of surviving in a foreign country while involuntarily taking online classes as second-language English learners (Koo, 2021b; Son et al., 2020). Since engaging international students in online classes is more difficult than engaging domestic students due to language barriers (Koo & Nyunt, 2022b), it is imperative to understand international students' unique challenges and experiences in the online learning environment during the uncertainty of the pandemic to meet their needs and provide timely support for them by employing the Theory of Social Support and the Community of Inquiry to explore different elements in online learning.

Purpose of the Study and the Research Questions

By using the Theory of Social Support and the Community of Inquiry as guiding theoretical frameworks, the purpose of this qualitative study was to explore international students' unique academic experiences and challenges with online learning during COVID-19. The study was guided by two research questions: 1) What kinds of unique academic experiences and challenges did international students encounter during COVID-19 in their online classes? 2) How did international students perceive online learning classes during the pandemic in cognitive, social, and teaching presence guided by the Community of Inquiry?

Theoretical Frameworks

Theory of Social Support

Social support is the perception and actual experience that one is cared for, has assistance from others, and is part of a supportive interpersonal social network, especially during major life transitions and crises (Cobb, 1976; Cooke et al., 1988). According to House (1981), there are four types of social support: emotional support, instrumental support, informational support, and appraisal support. *Emotional support* provides empathy, caring, love, trust, esteem, concern, and listening; *instrumental support* provides tangible aid such as money, labor, time, or any direct help; *informational support* provides advice, suggestions, directives, and information for use in coping with personal and environmental problems, and *appraisal support* provides affirmation, feedback, social comparison, and self-evaluation. Social support provides buffering resources for individuals during stressful life events and contributes to healthy well-being (Prati & Pietrantoni,

2010; Wang et al., 2003). In the online environment, supportive interactions on social networking sites were found to benefit adolescents' self-esteem (Zhou & Cheng, 2022). Both explicit verbal messages via Facebook (Rozzell et al., 2014; Vitak & Ellison, 2013) and implicit cues (e.g., Likes on Instagram and Facebook) could offer a form of emotional support (Carr et al., 2016). For college students that received less in-person social support, social media in the digital world could provide a source of online social support to help them battle depression and other adverse feelings (Cole et al., 2017). Particularly for international students that study in the host culture, more digital exposure could make it easier for them to adapt to online learning during the pandemic (Moon et al., 2020). With more learners joining online classes during the pandemic, we see an urgent need of applying the social support theory in the context of online learning to explore how different types of social support can be utilized to enhance people's online learning experiences especially for the international students with language barriers.

The Community of Inquiry (CoI)

The Community of Inquiry (CoI) framework has proposed a collaborative teaching and learning process in an online learning environment through three interdependent dimensions of presence: cognitive presence, social presence, and teaching presence (Garrison et al., 2000, 2001). Cognitive presence indicates the extent "to which the participants in any particular configuration of a community of inquiry can construct meaning through sustained communication" (Garrison et al., 2000, p. 89). This helps construct knowledge through online discourse and reflection in which learners collaborate to explore, construct, resolve, and confirm understandings to achieve critical educational goals in the online environment (Swan & Ice, 2010). Social presence refers to how people "project their characteristics into the community, thereby presenting themselves to the other participants as real people" (Garrison et al., 2000, p. 89) and is essential in facilitating cognitive presence and in achieving educational goals online. Teaching presence is about designing the teaching experience and facilitating students' learning processes, which makes it a necessary component to "support and enhance social and cognitive presence for the purpose of realizing educational outcomes" (Garrison et al., 2000, p. 90). Overall, cognitive, social, and teaching presence work collaboratively to create a sense of community in online learning, offer support, and make an impact on students' online learning outcomes (Garrison & Arbaugh, 2007; Stewart et al., 2021). As one of the widely used frameworks for building the online learning community, the CoI framework offers a lens through which to examine how international students perceive their online learning experiences based on cognitive presence, social presence, and teaching presence.

Literature Review

Impact of COVID-19 on International Students in the United States

While many students' academic experiences in United States higher education were deeply impacted under the constraints of COVID-19, international students reported unique challenges since they experienced this difficult time in a foreign country (Koo et al., 2022; Koo, Yao, et al., 2021). For example, shifting visa policies and travel restrictions left international students with unsettled futures; abrupt flight cancellations prevented international students from carrying out their routine travel plans; campus closures left them with few residential choices; and due to their immigration status, very few financial support programs were sensitive to international students' needs (Supiani et al., 2020). Such unique challenges in relation to

international students' legal status and immobility raise additional issues that domestic students do not encounter (Lipura, 2021; Ma et al., 2022; McDaniel et al., 2021).

The COVID-19 pandemic has impacted international students' socio-emotional and psychological well-being as well (Firang, 2020; Koo, 2021b; Koo & Nyunt, 2022b). People living through crises generally experience increased emotional distress and an impaired sense of personal self-worth, lose interpersonal contacts, and experience adverse effects on their academic performance (Regehr, 2011). During this pandemic, sleep disturbances, increased depression levels, higher anxiety, and loneliness were observed among university students in Hong Kong (Popovic & Lim, 2020). Lai et al. (2020) further found that in comparison with their counterparts who returned to their home countries, international students who stayed in the United States had higher stress levels due to COVID-19-related stressors, more personal health concerns, greater perceived stress, more severe insomnia symptoms, and less social support. This was found to be especially true for female international students, who experienced greater stress due to uncertainties about their academic work compared to their male peers (Lai et al., 2020). Furthermore, xenophobia, racism, and perceived discrimination during the pandemic, unfortunately, caused additional anxiety among international students (White, 2022; Zhang et al., 2022), particularly Chinese American college students in the United States (Haft & Zhou, 2021).

International Students' Social Support During the Pandemic

In most cases, a university's responses to and support for international students via its international office are major factors in these students' well-being and choice of school (Fisher, 2020). Research has shown that academic competency, academic culture shock, academic resources, intercultural communication, and pressure are the main sources of international students' academic stressors (Cao et al., 2021; Stewart & Lowenthal, 2022). Also, the heritage culture strongly affected Chinese international students' behavioral features in class and their responses to academic stressors during the process of acculturating from the heritage culture to the host culture (Cao et al., 2021). During the acculturation process, social support has been found to have a significant relationship with international students' psychological adjustment (Bender et al., 2019; Koo & Nyunt, 2020, Koo, Nyunt, et al., 2021; Koo, Kim, et al., 2021). Subjective social support, compared to objective social support, showed a stronger relationship with psychological adjustment.

International students' well-being during the pandemic has attracted much research attention, including a cross-sectional multi-country study with 110 higher education institutions in 26 countries in 2020. Right after the first peak of the pandemic, a series of surveys were created to collect data about international students' living conditions, financial conditions, and academic workload before and during the COVID-19 outbreak, as well as students' mental well-being, perceived stressors, and resources (Van de Velde et al., 2021). In addition to this research effort, more studies on international students' well-being and social support continue to be a necessity to provide more specific and culturally sensitive support for this population (Koo & Nyunt, 2022a).

International Students' Online Learning During the Pandemic

The pandemic has impacted educators and students worldwide at all levels from K-12 to higher education institutions (Bessett, 2020; Darling-Hammond & Hyler, 2020; Donitsa-Schmidt & Ramot, 2020; Firang, 2020; Kim & Asbury, 2020; la Velle et al., 2020; Supiani et al., 2020). While the abrupt change from face-to-face to online learning has brought teachers and higher

education faculty uncertainty and worries, its impact on international students has been extraordinarily profound across all subject domains. As all other students, international students must rely on remote, online formats to continue their studies, including self-initiated labs and dance studios across all geographic and temporal locations. Furthermore, their limited English proficiency brings additional challenges to their online learning (Koo & Nyunt, 2022b) that native English speaking students do not have to experience (Fischer, 2020).

For those international students who continue to stay abroad, research shows that those who are more used to new types of social networks (e.g., Twitter, YouTube) in their host countries are more likely to have more productive online learning experiences (Chang & Gomes, 2017). The more digital exposure they had before their journey from the heritage to the host culture, the more capable they were in online learning during the pandemic (Moon et al., 2020). While the impact online class modes bring to international students remains ever-changing, research indicates that metacognitive competence regarding internal management of cognitive load—the way students utilize online information—is critical to their successful online learning (Chen et al., 2012). Students normally tend to experience increased anxiety with online information overload (e.g., university emails, class announcements, and hypertext) and increased cognitive load in exclusively online learning, thus adversely impacting their online participation and engagement (Chen et al., 2012; Sandberg, 2013). Therefore, online course designers and universities need to understand international students' characteristics and behavior to establish valid communication channels and effectively engage them in learning.

While multiple studies have investigated international students' experiences in general, only a limited number of studies have analyzed the specific qualities of the unique lived and academic experiences of international students in U.S. higher education (Lin & Scherz, 2014; Mukminin & McMahon, 2013). While researchers have investigated international students' unique academic experiences taking online classes during the COVID-19 pandemic in international contexts (Stewart & Lowenthal, 2022; Stewart & Lowenthal, 2021), studies of international students' experiences of online learning in U.S. higher education are underdeveloped. In addition, in comparison to domestic students, international students' experiences of online courses have received less attention from online learning scholars despite the increasing number of online programs and international students. Likewise, compared to their domestic peers, international students have reported more negative academic experiences and academic challenges due to language barriers and unfamiliarity with U.S academic systems (Koo, 2021b; Koo & Nyunt, 2022a; Luo et al., 2019). Thus, this study will add to the body of literature on academic experiences among minoritized populations, including international students.

Methods

We used a qualitative approach (Creswell & Guetterman, 2019) given the exploratory nature of our inquiry. As we attempted to "discover and understand a phenomenon, a process, or the perspectives and worldviews of the people of the world involved" (Merriam, 1998, p. 11), we specifically employed a qualitative design in this study using culturally responsive focus groups (Rodriguez et al., 2011). To capture international students' unique cultural backgrounds that shape their online learning experiences, we employed a modified version of culturally responsive focus groups (Koo & Nyunt, 2022b; Koo, Yao, et al., 2021) to highlight "unique situational referents and perspectives [that] are used to acknowledge and connect participants' multiple experiences and social identities within the inquiry process" (Lahman et al., 2011; Rodriguez et

al., 2011, p. 401). We were especially attentive to international students' unique cultures and positionalities that differ from those of domestic students.

Participants

Our sample for this study consisted of 18 international students participating in three focus groups: eight men and 10 women from seven different countries, including China, India, Korea, Saudi Arabia, Turkey, Nigeria, and Mexico, representing eight different majors from seven different institutions in five geographic regions in the United States. Detailed demographic information on all participants is presented in Table 1.

Table 1
Demographic Information of Participants

Pseudonym	Gender	Degree Pursued	Major	Country of Origin	Region
Chung	F	Doctoral	Psychology	S. Korea	Midwest
Dohyun	M	Doctoral	Psychology	S. Korea	Midwest
Jamal	M	Bachelor	Biology	Nigeria	Mid-Atlantic
Jahwi	M	Doctoral	Education	S. Korea	Northeast
Lin	F	Bachelor	Accounting	China	Northeast
Maria	F	Master	English	Mexico	Northwest
Minjoo	F	Doctoral	Biomedical Engineering	S. Korea	Southwest
Qui	M	Bachelor	Biomedical Engineering	China	Mid-Atlantic
Sama	F	Master	Accounting	Turkey	Southwest
Selcuk	M	Bachelor	Psychology	Turkey	Mid-Atlantic
Seok	M	Doctoral	Electronic Engineering	S. Korea	Midwest
Sia	F	Master	Business	Saudi Arabia	Southwest
Suhyun	F	Doctoral	Sociology	S. Korea	Midwest
Pooja	F	Doctoral	Computer Science	India	Northeast
Wonsuk	M	Doctoral	Education	S. Korea	Northwest
Ying	F	Doctoral	Education	China	Northeast
Zheng	M	Bachelor	Civil Engineering	China	Southwest
Zhuo	F	Bachelor	Computer Science	China	Northwest

Upon receipt of Internal Research Board approval, we recruited participants. As part of a large longitudinal mixed-methods research project on diverse undergraduate and graduate students' experiences during and after COVID-19, purposeful sampling (Palinkas et al., 2015) was used to recruit international students who were born and raised in their home countries and were currently studying in the United States on temporary student visas (e.g., F1 student visa), and whose original family members were currently residing in their home countries. All participants were enrolled in degree programs at four-year research universities in the United States during the COVID-19 outbreak in the spring semester of 2020.

Data Collection

The three virtual focus group interviews were conducted by the first author via Zoom with four, six, and eight participants in each group, respectively. Each group interview lasted

approximately two hours and took place in July and August 2020. Participants received a $10 Amazon gift card as compensation for their participation. Before the focus group meeting, all participants reviewed and signed informed consent forms via email. At the beginning of the focus group interview, participants were asked to introduce themselves (e.g., their program of study, degree pursued, institution, location of the institution, and length of stay in the United States as an international student).

The interviewer asked participants about their academic experiences during COVID-19, including challenges, academic difficulties, and engagement in online learning environments. These interview questions are based on our theoretical framework, Community of Inquiry (Garrison et al., 2000) and social support (House, 1981), as well as current literature on international students' academic experiences (Koo, 2021b; Koo & Mathies, 2022). Focus group questions included, "Can you share any academic challenges and difficulties that you encountered during the pandemic as an international student?" and "Please share your own experiences of online classes, meetings, and research activities during the pandemic." The full list of interview questions is presented in Table 2 below. With participants' permission, focus group interviews were audio-recorded and later transcribed by the interviewer. After completing each interview, the interviewer also reflected on the interview in brief field notes.

Table 2
Focus Group Interview Questions

Questions	Additional Prompts
1. Tell me about unique experiences or challenges in your academic life during COVID-19. 2. Can you share any academic and social challenges and difficulties that you encountered during the pandemic as an international student? 3. Please share your own experiences of online classes, online meetings, and research activities via zoom during the pandemic. 4. What went well the best in your synchronous and asynchronous classes? And what were the least favorite things about taking synchronous and asynchronous classes?	- Tell me more about that experience. - Why did you think that way? - What was your emotion at that time? - What were your reactions then? - As other students just mentioned, does anyone have similar reactions or experiences? - Are there any other things that you want to share?

Data Analysis

Krueger and Casey's (2009) classic analysis framework, in combination with Braun and Clarke's (2014) approach to thematic analysis, was used for coding and analyzing transcripts and field notes. In an initial round of coding, each researcher highlighted keywords or phrases that addressed academic experiences and online learning experiences, guided by our research questions and theoretical framework; for example, we highlighted when participants shared

about their academic, social, and learning experiences as those are connected to cognitive, social, and teaching presence of Community Inquiry as well as Theory of Social Support. We also highlighted specific keywords about students' experiences in synchronous and asynchronous class formats. Upon the initial highlights, concepts that emerged consistently were grouped under categories such as social isolation, academic difficulties, English proficiency, and faculty support. Then we shared categories, developed a set of emerging findings, and examined all of them. We compared these to the additional data, further refining our categories: for example, we grouped students' perceived social isolation and loneliness under the category of social support. Next, the first author reviewed all interview transcripts again, comparing the categories to our theoretical framework to develop broader themes. The authors then teased out how participants' experiences were related to their unique online learning experiences as international students. In the final steps of data analysis, to ensure inter-rater reliability, the authors reviewed all grouped themes (e.g., social, academic, English, and faculty support) to make sure that contents of conversations and selected themes were consistent (Braun & Clarke, 2014; Krueger & Casey, 2009); we processed this stage twice.

Researchers' Positionality

The first author is a faculty member in an education program and was an international student who had experience taking online classes as a graduate student and thus has first-hand experience with the topic. The second author is also a current faculty member and a former international student in the field of education with more than 10 years of experience in teaching and taking online classes. Our positions as current faculty and former international students allowed us to quickly build rapport with participants and understand the conversation. Our insider perspectives also informed our interpretation of data, enabling us to capture international students' cultural backgrounds and unique online learning experiences.

Findings

We identified four key themes that encapsulated international students' experiences and challenges in online learning and are consistent with our research questions and the Community of Inquiry theoretical framework (Garrison, 2000): social isolation and being unable to build genuine interactions in online learning spaces during the COVID-19 pandemic, difficulties with engaging in online class discussions and activities, limited opportunities for improving English proficiency in online learning environments, and limited academic support from faculty and advisors.

Theme 1: Social Isolation and Being Unable to Build Genuine Interactions in Online Learning Spaces During the COVID-19 Pandemic

Most participants reported that due to limited social interaction and social support, social isolation was one of the most negative experiences of online learning during the pandemic. As reported, since the COVID-19 outbreak until the moment of the interview, most international students in this study stayed home and rarely went anywhere except for going grocery shopping and exercising outdoors, which meant that they barely had any in-person exchanges with others for a couple of months. Staying home alone for an extensive period with limited social support made them feel lonely and empty, which negatively affected their overall academic experiences in the United States. For example, Jamal, an undergraduate biology student from Nigeria, shared his feelings of isolation:

I really think that my loneliness and feeling of isolation are something different from those of domestic students. Feeling lonely in a foreign country is beyond the mere loneliness. I feel like I have no one to turn to when I want to speak here. Unlike domestic students, I don't have genuine friends or [a] support system that I can depend on here. This makes a huge difference. Also, this is not just for one time, but this loneliness will be here until I leave for my home country again. This prolonged loneliness is very difficult.

In addition, our participants reported that they were not able to build genuine relationships or supportive social interactions via online classes and online meetings because they did not feel comfortable interacting virtually in English. Thus, international students indicated that being international students taking online classes in the United States made them feel lonelier and more isolated. Minjoo, a doctoral student in an engineering program from South Korea indicated how hard it is to communicate in English naturally in online settings:

It's just very awkward and unnatural to speak English in Zoom. I am not sure if it is just me, but it has been very difficult for me to fully understand instructors' English and my peers' English when classes and discussions were via virtual spaces. I am not good at English already, but these virtual classes make my English even worse, and this makes me feel very lonely in online classes. Building [a] meaningful relationship via online classes is very limited for international students.

As in Minjoo's comment, we see repeated messages of loneliness and the lack of meaningful relationship during international students' online learning process. This indicates that social support is greatly needed to help international students learn and achieve their educational goals in the online community in the United States (Prati & Pietrantoni, 2010; Wang et al., 2003).

Theme 2: Difficulties with Engaging in Online Class Discussions and Activities
International students shared unique difficulties they encountered in online classes that prevented them from fully engaging in online class activities and discussions during the pandemic. Our participants reported that they felt less confident participating in online discussions or online group peer-review sections, not only because they were concerned about their limited English proficiency or accents but also because they did not feel comfortable or familiar with picking up conversation topics in online interactions. In addition, international students that are Asian felt the ongoing negative public views of Asian populations (Koo, Yao, et al., 2021), which increased Asian international students' discomfort in online classes. For example, Suhyun, a doctoral student in sociology from Korea, shared how online classes were more challenging for international students:

It is just so hard. Plus, it is harder for foreigners…. I guess our lives are harder in general compared to American students. Because we are foreigners. Also, being a foreigner makes it harder in the COVID-19 pandemic. They know the system. They know the language…. Here is their home, and it is not for us.

Some international students in the study shared that understanding and engaging with conversations in English is more difficult in online settings and when interactions happen via

online tools due to the lack of direct nonverbal communication. Minjoo shared her concerns regarding engaging in English conversations in online classes:

> I noticed that having conversations in class settings was not only involved with language but [a] more holistic approach in language and learning activities. For sure, to me, it has been so challenging for me to fully understand English instructions and engage in class participation. Of course, I am still not used to [the] American style of free conversations and discussions in classes, but I just don't know how to jump into the conversations when my peers exchange their thoughts. What if I am totally wrong and sound very weird? So it's sometimes much better to keep silent.

International students' struggles with joining free conversations seem to indicate a missing piece of cognitive presence (Garrison et al., 2000) in the online learning environment. Their previous traditional, face-to-face educational experiences and the different cultures they come from may not prepare them well for online learning because they did not intend to study abroad to take online classes and taking online classes with their second language is a challenge for international students (Koo, 2021; Koo & Nyunt, 2022b).

Theme 3: Limited Opportunities for Improving English Proficiency when Restricted to Online Learning Environments

Our participants indicated that they wanted to return home because taking online courses in the United States did not add value to their study abroad experiences. While they invested tremendously in the hope of maximizing their academic experiences and progress in the United States, opportunities for socializing with friends and learning about American culture became extremely limited in the online learning environment. The most frequently shared negative academic experience with online classes was that international students were not able to learn about American culture to improve their English proficiency as much as they expected. For example, Sia, a master's student in business from Saudi Arabia, addressed how her English was not improved during the pandemic:

> I know that English is not everything, but it's everything for some international students. Getting a degree is a very important purpose for me, but English proficiency and learning about American culture are another good reason to study abroad and why I am here. However, those benefits are paused now as all those learning opportunities are online. Learning English in [an] online environment is not the best option for international students. Language is about learning culture and people and daily lives, but these are not happening right now due to the pandemic, and I feel like I lost all those opportunities because of this unique situation.

Like Sia, our participants shared that online interaction opportunities were so limited that they didn't believe they were fully engaged in learning, and they did not see any improvement in their English proficiency in online spaces. In addition, international students shared their complaint that taking online courses in the United States is not good value for the amount of tuition the students are paying. For example, Pooja, a doctoral student in engineering from India, discussed why taking online classes is so challenging for international students in terms of the financial investment:

> I did not intend to study abroad to take online classes and not engage in other academic activities. But there is no choice. I paid too expensive tuition, but what I am doing now is taking online classes and no internship, no practicum. That's unfair. But it's just hard for me to pack and go back to India now. I don't learn as much as I am supposed to learn

during the pandemic. I can learn English even when I am taking classes back in India in my undergraduate study because I went to a college where English was the official language in the institution in India. Why am I here in America with too much tuition paid?

As Pooja and other international students shared, taking online classes in American higher education during the pandemic makes it difficult for international students to maximize their learning due to the limited opportunities to improve their English proficiency or knowledge acquisition. (Koo, 2021b).

Theme 4: Limited Academic Support from Faculty and Advisors

International students in our study also reported that they had limited opportunities to interact with faculty and to receive support from faculty and advisors. These students reported that they rarely met with professors or their advisors virtually during the COVID-19 pandemic, while before the pandemic they used to interact with faculty and advisors more frequently via in-person meetings. Students indicated that they found it more difficult and hesitated to approach faculty and advisors to initiate one-on-one online meetings. Reasons varied from international students feeling awkward about virtual one-on-one meetings, limited English proficiency in virtual meetings, and unfamiliarity with online interactions. Seok, a Korean student in an engineering doctoral program, shared his feeling of being "lost" in terms of his relationship with his advisor during the pandemic:

As a doctoral student in [an] engineering program, lab experiences and close connections with my advisor [are] the key to success and key to timely graduation. But I lost this over the pandemic. I don't know why, but I lost contact with my advisor. Of course, we still communicate, and I think he is still my advisor, but I feel lost. It was not always easy for me to actively approach my advisor and take the initiative to meet with him for my academic progress. Although I feel an urgency sometimes, I just talk to myself "later" because I feel it is not very natural to talk to him only via Zoom. I wish I could attend the lab session and meet with [him]. This COVID-19 blocks those opportunities to work with my advisor in virtual settings, and I think this is only happening to me because I am afraid of active contact with him. I don't know why.

Like Seok, such a lack of academic support prompts the question of how we can improve cognitive, social, and teaching presence in online teaching (Garrison et al., 2000) considering international students' unique circumstances and challenges, particularly considering the intersections of their sociality, language, internationality, and culture.

Discussion

By exploring international students' unique experiences and perspectives on online learning during the pandemic, our results call for more social support to facilitate international students' online learning based on both the CoI framework (Garrison, et al., 2000) and the social support theory (House, 1981). During the pandemic, international students lost direct, in-person opportunities to seek support from faculty and staff while improving and building confidence in their English proficiency. Given such, they became hesitant to fully participate in the learning activities as classes abruptly changed to the online format.

In this study, it is evident that cognitive, teaching, and social presence (Garrison, et al., 2000) are severely lacking in international students' online learning. Due to their English barriers and the lack of an adequate support system, they feel like second language learner "foreigners"

and are not able to completely construct meaning through sustained communication as their American peers. Their hesitation in collaboratively joining online discussions prevented them from building online discourse and reflection, constructing knowledge, and further achieving educational goals via the triggering event, exploration, integration, and resolution cycle (Garrison, 2007). Similar to Dong and Ishige (2022) who noted teaching presence's vital role in shaping students' online learning experiences in an examination of international students' study-abroad-from-home experiences during the pandemic, our findings suggest that improvement in teaching presence is greatly needed to ensure that the international students feel safe learning online, particularly in discourse facilitation (Garrison & Arbaugh, 2007; Garrison et al., 2000). Anderson et al. (2001) conceptualized facilitating discourse based on how students are engaged in the process of interacting with the information provided in the course materials. To facilitate discourse, instructors are expected to create a sense of course community, engage students in learning, keep students on track, review students' comments, raise questions, and check for students' understanding (Richardson et al., 2012). To make that happen, instructional strategies should take account of international students' unique cultural backgrounds so international students can feel comfortable about the "American style of free conversations and discussions in classes" and learn how to "jump into the conversations" in the online learning environment. One of Fiock's (2020) principles of good practices for the online teaching stated that online instructors need to recognize students' diverse ways of learning and include a wide variety of instructional strategies to meet their needs. This is especially true for international students who involuntarily switched to online learning during the pandemic.

What stood out in our study is international students' social isolation and limited perceived social presence in online classes. Due to international students' English barriers and limited support systems, it is quite challenging for them to present themselves as "real people" in the online learning environment (Garrison et al., 2000) while they feel isolated in a foreign country away from their family and friends back home (Koo & Tan, 2021). Garrison et al. (2000) proposed emotional expression, open communication, and group cohesion in social presence. It looks like the "prolonged loneliness" repeatedly reported by the international students in our study limits their capabilities in sharing personal expressions, developing mutual awareness, and building and sustaining a sense of group commitment. A sense of inferiority further worsens the situation as the international students perceive their loneliness that takes place "in a foreign country is beyond the mere loneliness" of domestic students. It makes them feel "awkward and unnatural" to speak English in online classes, not to mention being real in the online learning process. This finding echoes Englander and Russell's (2022) study that both international students and instructors in an online English learning program identified social presence as the least satisfying in their online learning experiences during pandemic. Both groups reported the that students were not able to form social bonds with each other as in the face-to-face setting.

Furthermore, among the four domains of social support according to House (1981), i.e., emotional support, instrumental support, informational support, and appraisal support, the lack of emotional support and instrumental support are evident in study, with emotional support being the most needed. In online learning, while information support (e.g., advice, suggestions, information) can be provided via learning materials such as recorded lecture and YouTube clips and appraisal support (e.g., evaluation, feedback) can be provided via constructive feedback on students' work, emotional support (e.g., empathy, love, trust, caring) and instrumental support (e.g., tangible aid and service) present more challenging tasks for instructors to think beyond what they traditionally do in face-to-face classes (Federici & Skaalvik, 2013).

Instrumental support provides tangible aid such as, money, labor, time, or any direct help in students' learning. For instance, teachers help students solve a problem or accomplish a difficult task (House, 1981). Instrumental support in the online space could start from holding frequent, synchronous virtual meetings to increase faculty presence or responding to emails timely to help solve problems (Wells et al., 2022). For international students who may need extra help in understanding a new educational system online, more instrumental support from online instructors is especially important. Our data revealed a lack of instrumental support under the unrealistically challenging tasks such as the dilemma international students face between "paying too much tuition" and taking online courses "without internship or practicum" opportunities. Such situations leave the international students with tough decisions on whether they should go back to their home country or stay at a higher cost. While online learning has made higher education convenient—and indeed, possible—during the global pandemic, international students encounter different challenges in online learning environments that counterpart domestic students experience, only to a much lesser extent (Koo & Nyunt, 2022b; Son, 2020).

In this case, emotional support becomes increasingly vital. Online instructors must ask themselves how they should provide empathy, caring, love, trust, esteem, concern, and listening and whether students receive it (Han & Resta. 2020). While verbal and nonverbal cues in the face-to-face classroom setting can easily express caring, love, and empathy, online instructors must make additional efforts to ensure that their caring shows in the online space and the students can feel that the instructor is available to listen to them and care about their learning (Bailey et al., 2022). While the need for emotional support remains true for all online learners (Cleveland-Innes & Campbell, 2012; Lipman, 2003) including nontraditional adult students (Jiang & Koo, 2020), in this study we see a greater need for emotional support among the international students who come from different educational environments and are still working on their English competency. Under the pandemic, international students involuntarily took online courses and some of them feel "lost" after the abrupt change. For instance, they are not able to "actively approach advisor" despite feeling "an urgency" to do so due to varied reasons. One participant in our study reported "I have no one to turn to when I want to speak here… [since] I don't have genuine friends or a support system." In this case, any culturally sensitive supports of showing empathy, caring, trust, esteem, concern, or simply listening could make a huge different for the international online students. Any small gesture from the online instructor may attend to international students' needs given their unique situation during the pandemic. Even if this effort is only a smiley face at the end of an email, the caring tone in answering international students' questions, or a proactive email reaching out to the international students to ask if they need help, small steps help build relationships and deliver emotional support in the online environment. While international students struggle with conversing freely in online classes, they may just need a few words of encouragement and praise.

Limitations and Recommendations for Research

We recognize our study's limitations. First, the findings represent international students from limited geographical regions and from a limited number of institutions in the United States; these factors limit our study's generalizability to international students studying at higher education institutions in other regions of the United States. Therefore, a more systematic investigation comparing experiences across different regions and countries of origin will provide insight into how institutions' geographic locations shape international students' experiences on

online learning. Second, our analysis is limited to international students' experiences during one part of their academic journey and do not reflect their development over a longer course of study. Our study does not capture changes in international students' academic experiences. Thus, longitudinal research tracing changes over multi-wave time points would provide more insight into changes in minoritized students (Koo, 2021a) including international students' online learning experiences. Given that international students' English proficiency requires a few years of exposure (Hyun et al., 2018), a longitudinal investigation of international students' improvement in English proficiency and their adjustment to the online learning environment should provide further insight. Third, we investigated international students' experiences as one group although our participants come from different countries and cultural backgrounds. This study did not capture cultural diversity or the uniqueness of different cultural impacts on students' academic experiences. Thus, this study suggests a need to further explore experiences of specific cultural groups to gain better insight into international students' experiences in online learning and online classes.

Practical Implications

Our study provides several insights into supporting international students' online classes during and after the pandemic. First, given that international students feel lonely and isolated in online learning environments, it is imperative to provide these students with culturally sensitive social and community support (Koo & Mathies, 2022). While many forms of online social support for students are still very U.S.-centric and not culturally responsive to minority students in the U.S. higher education system (Koo & Nyunt, 2022a), it is important to create and develop community programs that would work for international students in online learning environments, such as online dissertation support groups or survival skills workshops for online classes. To create practical and applicable programs for international students, we recommend that online support developers who have worked with international students or who understand international students' unique needs are necessary.

Second, our study suggests that international students have been experiencing challenges in learning English and improving it in online learning environments during the pandemic. It is important for faculty, advisors, and practitioners to understand that international students are concerned about their English proficiency and help them to access practical resources and services to improve it. Further, it is critical not to blame international students for their limited English proficiency, but to understand the pernicious influence of the nativist perspective, in which English is the language of global domination (Koo, Baker, et al., 2021; Koo, Kim, et al., 2021).

Third, our findings indicate that because international students have limited interactions with their faculty advisors and don't feel comfortable working with their advisors online, this factor also will impede their academic progress (Koo & Nyunt, 2022b). Thus, we strongly recommend that educators, faculty, and advisors who work with international students provide culturally sensitive support (Koo & Nyunt, 2020) or support programs to accommodate international students' unique needs in online environments. For this, we recommend that academic affairs and student affairs collaborate with counseling centers or international student offices to develop new advising support systems that would better meet international students' needs. It is important to understand that some services that are designed for traditional domestic students do not work for international students. Therefore, it is important for practitioners and educators understand and learn more about international students' unique challenges in online

environments to better support them through challenging situations such as the COVID-19 pandemic.

Significance of the Study

The current study sheds new light on international students' experiences in online classes and online learning environments in the United States during COVID-19. Given that international students are among minoritized groups and face unique situations, these findings will contribute to the literature on higher education and online learning as well as on counseling and international education. Our findings offer insights into establishing appropriate support systems for international students, especially in terms of their online academic environments. We hope that this study provides insights that will help faculty and staff who work with the international student population to better understand their experiences and needs during the uncertain times of the pandemic and to support these students during the post-pandemic era as well.

Declarations

The authors declared no conflicts of interest.

All procedures performed in studies involving human participants were in accordance with the ethical standards and approval of Texas A&M University-Commerce.

Informed consent was obtained from all individual participants included in the study.

References

Alzoubi, H., Alnawaiseh, N., Al-Mnayyis, A., Abu-Lubad, M., Aqel, A., & Al-Shagahin, H. (2020). COVID-19 – knowledge, attitude and practice among medical and non-medical university students in Jordan. *Journal of Pure & Applied Microbiology: An International Research Journal of Microbiology, 14*(1), 17-24. https://doi.org/10.22207/JPAM.14.1.04

Anderson, T., Rourke, L., Garrison, D., &Archer, W. (2001). Assessing teaching presence in a computer conferencing context. *Journal of Asynchronous Learning Networks, 5*(2), 1-17.

Bailey, D., Almusharraf, N., & Almusharraf, A. (2022). Predicting social presence in videoconference-supported LMS courses: Mediation through L2 writing and speaking strategies. *Online Learning, 26*(2), 148-169.

Bender, M., van Osch, Y., Sleegers, W., & Ye, M. (2019). Social support benefits psychological adjustment of international students: Evidence from a meta-analysis. *Journal of Cross-Cultural Psychology*, *50*(7), 827–847. https://doi.org/10.1177/0022022119861151

Bessette, L. (2020). Online learning and pandemic pedagogy amidst the COVID-19 crisis. *ACTA*. https://www.goacta.org/2020/03/lee-bessette-online-learning-and-pandemic-pedagogy-amidst-the-covid-19-crisis/

Braun, V., & Clarke, V. (2014). What can "thematic analysis" offer health and wellbeing researchers? *International Journal of Qualitative Studies on Health and Well-being, 9(*1), 1-2. https://doi.org/10.3402/qhw.v9.26152

Cao, C., Zhu, C., & Meng, Q. (2021). Chinese international students' coping strategies, social support resources in response to academic stressors: Does heritage culture or host context matter? *Current Psychology, 40*(1), 242-252. https://doi.org/10.1007/s12144-018-9929-0

Carr, C., Wohn, D., & Hayes, R. (2016). As social support: Relational closeness, automaticity, and interpreting social support from paralinguistic digital affordances in social media. *Computers in Human Behavior*, *62*, 385–393. https://doi.org/10.1016/j.chb.2016.03.087

CDC. (2021). COVID-19 integrated county view. *COVID Data Tracker*. https://covid.cdc.gov/covid-data-tracker/ - county-view

Chang, S., & Gomes, C. (2017). Digital journeys: A perspective on understanding the digital experiences of international students. *Journal of International Students, 2*(11), 347-366. https://doi.org/10.32674/jis.v7i2.385

Chen, C., Pedersen, S., & Murphy, K. L. (2012). The influence of perceived information overload on student participation and knowledge construction in computer-mediated communication. *Instructional Science, 40,* 325–349. https://doi.org/10.1007/s11251-011-9179-0

Cleveland-Innes, M., & Campbell, P. (2012). Emotional presence, learning, and the online learning environment. *The International Review of Research in Open and Distance Learning, 13*(4), 269– 292. https://doi.org/10.19173/irrodl.v13i4.1234

Cobb, S. (1976). Social support as a moderator of life stress. *Psychosomatic Medicine*, *38*(5), 300–314. https://doi.org/10.1097/00006842-197609000-00003

Cole, D., Nick, E., Zelkowitz, R., Roeder, K., & Spinelli, T. (2017). Online social support for young people: Does it recapitulate in-person social support; can it help? *Computers in Human Behavior*, *68*, 456–464. https://doi.org/10.1016/j.chb.2016.11.058

Cooke, B. D., Rossmann, M. M., McCubbin, H. I., & Patterson, J. M. (1988). Examining the definition and assessment of social support: A resource for individuals and families. *Family Relations*, *37*(2), 211–216. https://doi.org/10.2307/584322

Creswell, J. W., & Guetterman, T. C. (2019). *Educational research: Planning, conducting and evaluating quantitative and qualitative research*. Pearson.

Darling-Hammond, L., & Hyler, M. E. (2020). Preparing educators for the time of COVID … and beyond. *European Journal of Teacher Education, 43*(4), 457-465. https://doi.org/10.1080/02619768.2020.1816961

Dong, Y., & Ishige, A. (2022). Studying abroad from home: An exploration of international graduate students' perceptions and experiences of emergency remote teaching. *Education Sciences, 12*(2), 98. https://doi.org/10.3390/educsci12020098

Donitsa-Schmidt, S., & Ramot, R. (2020). Opportunities and challenges: Teacher education in Israel in the covid-19 pandemic. *Journal of Education for Teaching, 26*(4), 1-10. https://doi.org/10.1080/02607476.2020.1799708

Federici, R. A., & Skaalvik, E. M. (2013). Students' perceptions of emotional and instrumental teacher support: Relations with motivational and emotional responses. *International Education Studies. 7*, 21-36. http://dx.doi.org/10.5539/ies.v7n1p21

Fiock, H. (2020). Designing a Community of Inquiry in online courses. *The International Review of Research in Open and Distributed Learning, 21*(1), 135-153. https://doi.org/10.19173/irrodl.v20i5.3985

Firang, D. (2020). The impact of COVID-19 pandemic on international students in Canada. *International Social Work, 63*(6), 820-824. https://doi.org/10.1177/0020872820940030

Fischer, K. (2021). The stranded. *The Chronicle of Higher Education, 67*(14), 24. https://www.chronicle.com/article/the-stranded

Garrison, D. R. (2007). Online community of inquiry review: Social, cognitive, and teaching presence issues. *Journal of Asynchronous Learning Networks, 11*(1), 61-72. https://files.eric.ed.gov/fulltext/EJ842688.pdf

Garrison, D. R., Anderson, T., & Archer, W. (2000). Critical inquiry in a text-based environment: Computer conferencing in higher education. *Internet and Higher Education, 2*(2-3), 87–105. https://doi.org/10.1016/S1096-7516(00)00016-6

Garrison, D. R., Anderson, T., & Archer, W. (2001). Critical thinking, cognitive presence, and computer conferencing in distance education. *American Journal of Distance Education, 15*(1), 7–23. https://doi.org/10.1080/08923640109527071

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

Haft, S. L., & Zhou, Q. (2021). An outbreak of xenophobia: Perceived discrimination and anxiety in Chinese American college students before and during the COVID-19 pandemic. *International Journal of Psychology, 56*(4), 522-531. https://doi.org/10.1002/ijop.12740

Han, S., & Resta, P.E. (2020). Virtually authentic: Graduate students' perspective changes toward authentic learning while collaborating in a virtual world. *Online Learning, 24*(4), 5- 27. https://doi.org/10.24059/olj.v24i4.2326

House, J. S. (1981). *Work stress and social support*. Addison-Wesley.

Hyun, E., Kretovics, M., & Crowe, A. (2018). Curriculum characteristics of time-compressed course in a U.S. *Higher Education Institution, 6*(1), 1-11.

Jiang, M., & Koo, K. (2020). Emotional presence in building an online learning community among non-traditional higher education students. *Online Learning Journal, 24*(4), 93–111. http://doi.org/10.24059/olj.v24i4.2307

Kim, L. E., & Asbury, K. (2020). 'Like a rug had been pulled from under you': The impact of COVID-19 on teachers in England during the first six weeks of the UK lockdown. *British Journal of Educational Psychology, 90*(4), 1062-1083. https://doi.org/10.1111/bjep.12381

Koo, K. (2021a). Am I welcome here? Campus climate and psychological well-being among racially minoritized students. *Journal of Student Affairs Research and Practice, 58*(2), 196–213. https://doi.org/10.1080/19496591.2020.1853557

Koo, K. (2021b). Distressed in a foreign country: Mental health and well-being among international students in the United States during COVID-19. In Bista, K. & Chan, R. (Eds.), *Routledge Studies in Global Student Mobility Series- Impact of COVID-19 on Global Student Mobility and Higher Education.* (pp.28-41). Routledge. https://doi.org/10.4324/9781003138402

Koo, K., Baker, I., & Yoon, J. (2021). The first year acculturation: A longitudinal study on acculturative stress and adjustment among the first year international college students. *Journal of International Students, 11*(2), 278-198. https://doi.org/10.32674/jis.v11i2.1726

Koo, K., Kim, Y., & Lee, J., & Nyunt, G. (2021). It's my fault? A qualitative study on Korean international graduate students' psychological well-being and experiences. *Journal of International Students. 11*(4), 790-811. https://doi.org/10.32674/jis.v11i4

Koo, K. & Mathies, C. (2022). New voices from intersecting identities among International students around the world: Transcending single stories of leaving and going. *Journal of International Students. 12*(S2), 1–12. https://doi.org/10.32674/jis.v12iS2.4776

Koo, K. & Nyunt, G. (2022a). Mom, Asian international student, doctoral student, and in-between: Exploring Asian international doctoral student mothers' mental well-being. *Journal of College Student Development. 63*(4), 414-431. https://doi.org/10.1353.csd.2022.0035

Koo, K. & Nyunt, G. (2022b). Pandemic in a foreign country: Barriers to international students' well-being during COVID-19. *Journal of Student Affairs Research and Practice*. Online First Publication. https://doi.org/10.1080/19496591.2022.2056476

Koo, K., Nyunt, G., & Wang, B. (2021). Who spends too much time online? Associated factors of Internet addiction among international college students in the United States. *Journal of International Students, 11*(1), 122–143. https://doi.org/10.32674/jis.v11i1.2063

Koo, K., & Nyunt, G. (2020). Culturally sensitive assessment of mental health for international students. *New Directions for Student Services, 2020*(169), 43–52. https://doi.org/10.1002/ss.20343

Koo, K. & Tan, G. (2021). Mental wellness and stressors among international students in the United States during the COVID-19 pandemic. In Ghim, H. & Choi, S. (Eds.), *Transnational Education Post COVID-19: Rethinking the Future of Transnational Higher Education.* (pp.82-113) Dague University Press.

Koo, K., Yao, C., & Gong, H. (2021). It is not my fault: Exploring experience and perceptions of racism among international students during COVID-19. *Journal of Diversity in Higher Education.* Online First Publication. https://doi.org/10.1037/dhe0000343

Krueger, R. & Casey, M. (2009). Focus groups: A practical guide for applied research. Sage.
Lahman, M. E., Geist, M., Rodriguez, K., Graglia, P., Deroche, K. (2011). Culturally responsive relational reflexive ethics in research: The three R's of ethics. *Quality and Quantity: International Journal of Methodology, 45*(6),1397-1414, https://doi.org/10.1007/s11135-010-9347-3

Lai, A., Lee, L., Wang, M., Feng, Y., Lai, T., Ho, L., Lam, V., Ip, M., & Lam, T. (2020). Mental health impacts of the COVID-19 pandemic on international university students, related stressors, and coping strategies. *Frontiers in Psychiatry, 11*, 584240–584240. https://doi.org/10.3389/fpsyt.2020.584240

La Velle, L., Newman, S., Montgomery, C., & Hyatt, D. (2020). Initial teacher education in England and the Covid-19 pandemic: challenges and opportunities. *Journal of Education for Teaching, 46*(4), 596-608. https://doi.org/10.1080/02607476.2020.1803051

Lin, S. & Scherz, S. (2014). Challenges facing Asian international graduate students in the US: Pedagogical considerations in higher education. *Journal of International Students, 4*(1), 16-33. https://doi.org/10.32674/jis.v4i1.494

Lipman, M. (2003). *Thinking in education (1st ed.).* Cambridge University Press.

Lipura, S. J. D. (2021). Deconstructing the periphery: Korean degree-seeking students' everyday transformations in and through India. *Research in Comparative and International Education, 16*(3), 252–275. https://doi.org/10.1177/17454999211038769

Luo, Z., Wu, S., Fang, X., & Brunsting, N. C. (2019). International students' perceived language competence, domestic student support, and psychological well-being at a U.S. university. *Journal of International Students, 9*(4), 954–971. https://doi.org/10.32674/jis.v0i0.605

Ma, X., Wang, B., & He, X. (2022). Migration aspirations and polymorphic identifications of the homeland: (Im)mobility trajectories amongst Chinese international students amidst COVID-19. *Global Studies in Culture and Power.* Advance online publication. https://doi.org/10.1080/1070289X.2022.2083411

McDaniel, A., Dionne, J., & Regan, E. (2021). Examining international students' holistic wellness. *Journal of Student Affairs Research and Practice, 58*(2), 227–240.

Merriam, S.B. (1998). *Qualitative Research and Case Study Applications in Education.* Jossey-Bass.

Moon, C. Y., Zhang, S., Larke, P., & James, M. (2020). We are not all the same. *Journal of International Students, 10*(1), 28–49. https://doi.org/10.32674/jis.v10i1.770

Mukminin, A., & McMahon, B. J. (2013). International graduate students' cross-cultural academic engagement: Stories of Indonesian doctoral students on an American campus. *Qualitative Report, 18*(35), 1-19. https://doi.org/10.46743/2160-3715/2013.1473

Palinkas, L., Horwitz, S., Green, A., Wisdom, J, Duan, N., & Hoagwood, K. (2015). Purposeful sampling for qualitative data collection and analysis in mixed method implementation research. *Administration and Policy in Mental Health and Mental Health Services, 42*(5), 533-544. https://doi.org/10.1007/s10488-013-0528-y

Popovic, M., & Lim, F. (2020). The mental health and wellbeing of university students during the COVID-19 pandemic. *Journal of Pain Management, 13*(4), 319–322.

Prati, G., & Pietrantoni, L. (2010). The relation of perceived and received social support to mental health among first responders: A meta-analytic review. *Journal of Community Psychology, 38,* 403-417. https://doi.org/10.1002/jcop.20371

Regehr, C. (2011). Crisis theory and social work treatment. In F. J. Turner (ed.), *Social work treatment: Interlocking theoretical approaches* (pp. 134–143). Oxford University Press.

Richardson, J. C., Arbaugh, J. B., Cleveland-Innes, M., Ice, P., Swan, K. P., Garrison, D. R. (2012). Using the Community of Inquiry framework to inform effective instructional design. In: Moller, L., Huett, J. (eds) *The Next Generation of Distance Education.* Springer, Boston, MA. https://doi.org/10.1007/978-1-4614-1785-9_7

Rodriguez, K. L., Schwartz, J. L., Lahman, M. K., & Geist, M. R. (2011). Culturally responsive focus groups: Reframing the research experience to focus on participants. *International Journal of Qualitative Methods, 10*(4), 400-417. https://doi.org/10.1177/160940691101000407

Rozzell, B., Piercy, C., Carr, C. T., King, S., Lane, B., Tornes, M., et al. (2014). Notification pending: online social support from close and nonclose relational ties via Facebook. *Computers in Human Behavior, 38,* 272-280. http://dx.doi.org/10.1016/j.chb.2014.06.006

Sandberg. (2013). Hypertext: Its Nature and Challenges for College Students. *Journal of College Reading and Learning, 44*(1), 51–71. https://doi.org/10.1080/10790195.2013.10850372

Son, C., Hegde, S., Smith, A., Wang, X., & Sasangohar, F. (2020). Effects of COVID-19 on college students' mental health in the United States: Interview survey study. *Journal of Medical Internet Research. 22*(9), 1-14. https://doi.org/10.2196/preprints.21279

Stewart, W. & Lowenthal, P. (2022) Distance education under duress: a case study of exchange students' experience with online learning during the COVID-19 pandemic in the Republic of Korea. *Journal of Research on Technology in Education, 54*(1), 273-287. https://doi.org/10.1080/15391523.2021.1891996

Stewart, W. & Lowenthal, P. (2021) Experiences and perceptions of exchange students learning online during the COVID-19 pandemic in the Republic of Korea: An exploratory descriptive study. *Asian Journal of Distance Education 16*(1), 119-140.

Stewart, M. K., Hilliard, L., Stillman-Webb, N., & Cunningham, J.M. (2021). The community of inquiry in writing studies survey: Interpreting social presence in disciplinary contexts. *Online Learning, 25*(2), 73-94. https://doi.org/10.24059/olj.v25i2.2275

Supiani, Rafidiyah, D., Yansyah, & Nadia, H. (2020). The emotional experiences of Indonesian PhD students studying in Australia during the COVID-19 pandemic/Pengalaman Emosional Mahasiswa Program Doktor Asal Indonesia Belajar di Australia selama Pandemi COVID-19. *Journal of International Students, 10*(S3), 108-125.

Swan, K, & Ice, P. (2010). The community of inquiry framework ten years later: Introduction to the special issue. *The Internet and Higher Education, 13*(1-2), 1-4. https://doi.org/10.1016/j.iheduc.2009.11.003

Taghrir, M. H., Borazjani, R., & Shiraly, R. (2020). COVID-19 and Iranian medical students: A survey on their related-knowledge, preventive behaviors and risk perception. *Archives of Iranian Medicine, 23*(4), 249-254. https://doi.org/10.34172/aim.2020.06

Van de Velde, S., Buffel, V., Bracke, P., Van Hal, G., Somogyi, N. M., Willems, B., & Wouters, E. (2021). The COVID-19 International Student Well-being Study. *Scandinavian Journal of Public Health, 49*(1), 114–122. https://doi.org/10.1177/1403494820981186

Vitak, J., & Ellison, N. B. (2013). 'There's a network out there you might as well tap': Exploring the benefits of and barriers to exchanging informational and support based resources on Facebook. *New Media & Society, 15*(2), 243-259. http://dx.doi.org/10.1177/1461444812451566

Wang, H. H., Wu, S. Z., & Liu, Y. Y. (2003). Association between social support and health outcomes: A meta-analysis. *The Kaohsiung Journal of Medical Sciences, 19*(7), 345-350. https://doi.org/10.1016/S1607-551X(09)70436-X

Wells, C. N., Pass, M. B., & Walsh, J. E. (2022). Face-to-face vs. online asynchronous teaching in a conservation biology course. *Online Learning, 26*(2), 241-253.

White, A. (2022). Xenophobia, prejudice, and blame in pandemic times. *The Lancet (British Edition), 399*(10324), 512–513. https://doi.org/10.1016/S0140-6736(22)00197-0

WHO. (2021). Weekly epidemiological update on COVID-19 – 20 April 2021. Word Health Organization. https://www.who.int/publications/m/item/weekly-epidemiological-update-on-covid-19---20-april-2021

Zhang, X., Wong, G. T. F., Liu, C. H., Hahm, H. "Chris", & Chen, J. A. (2022). International student stressors and mental health during the COVID-19 pandemic: A qualitative study. *Journal of American College Health*, 1–7. https://doi.org/10.1080/07448481.2022.2068015

Zhou, Z. & Cheng, Q. (2022). Relationship between online social support and adolescents' mental health: A systematic review and meta-analysis. *Journal of Adolescence (London, England.), 94*(3), 281–292. https://doi.org/10.1002/jad.12031

Introduction to OLJ Volume 26, Issue 4

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In section II of this issue, we have 12 papers that have been reviewed through our regular submission process. These papers cover a variety of topics including argumentation in online discussion, project-based learning, authentic learning, belonging, professional development in online education settings, as well as systematic reviews of literature.

In "Online Verbal Argumentative Interaction (OVAI) in an Online Science Class during the Covid-19 Pandemic" authors Pablo Antonio Archila, Anne-Marie Truscott de Mejía, and Silvia Restrepo of Universidad de los Andes, Colombia, take on the importance of argumentation in promoting student-centered learning in online science instruction. These authors review research indicating that the transition to online learning caused by the pandemic opened opportunities to rethink how we organize and facilitate deep learning that moves away from instructor-centered approaches. They highlight the possibilities inherent in organizing online science instruction around authentic argumentation that promotes more productive interaction between students. In a science course, they develop a framework for online verbal argumentative interaction (OVAI) that investigates whether this provides students with explicit opportunities to co-construct reason-based and/or evidence-based arguments and counterarguments. They also assess student perceptions of this approach. They conclude that the OVAI framework can be implemented, that it does result in productive student discourse in a science setting, and that students have positive opinions about the OVAI sessions. This paper also includes helpful tips for creating learner-centered instruction and an evaluative framework for analyzing student argumentation in a science context.

While learner-centered instruction is one way to improve online learning, we should not lose sight of the role of the instructor in its implementation. The next paper, "The Community of Inquiry Perspective on Teachers' Role and Students' Evaluations of Online Project-Based Learning" by Pengyue Guo and Nadira Saab of Leiden University Graduate School of Teaching, The Netherlands; Danli Ren of Southeast University, China, and Wilfried Admiraal of Oslo Metropolitan University, Norway, focuses on the importance of the instructional role in implementing another learner-centered approach—online project-based learning (PjBL). In this paper the authors investigate graduate law students' evaluations of online PjBL and how it is related to the role of the teacher at a Chinese university through the lens of the Community of Inquiry framework. Using survey research methods, the authors conclude that instructional design and organization played a different role in students' perceived benefits of PjBL in different phases of the course. In the first four weeks, these aspects of teaching presence showed a positive influence on students' perceived benefits in an assigned case analysis activity. This result revealed the importance of good design and organization in the early stages of the online learning process. These become less important as the course progressed, which may not be surprising as students need less guidance as they become familiar with a course. Overall, the authors found that various aspects of teaching presence and social presence have both direct and indirect effects on students' evaluations of online project-based learning.

Investigating the role of the online instructor is continued in "Faculty as Designers of Authentic Learning Projects in Online Courses" by Victoria Abramenka-Lachheb of the University of Michigan and Gamze Ozogul of Indiana University Bloomington. The goal of this

study was to examine public health faculty's design and instructional practices that include authentic learning in a fully online graduate health program, and gain insight into how their interpretations of authentic learning are reflected in their courses. The study's participants include 10 faculty who engaged in both brief surveys and in-depth interviews that revealed both convergent and divergent conceptions of authentic learning. The faculty agreed that authentic learning is typically situated in real-world contexts and is relevant to learners' future careers. At a practical level connection between learning and future work therefore need to be designed into online coursework. Some divergent perspectives include a focus on authentic learning as personally meaningful in a subset of faculty interviewees and the need to reduce hierarchies between faculty and students in authentic learning environments. The authors conclude that considering its nuanced and complex nature, the term *authentic learning* has multiple interpretations and meanings. The paper also includes implications for research and practice.

The next paper in section II is "Making Sense of Crisis: Instructional Designers' Experiences with Emergency Remote Teaching" by Rhea Moreno, Lee Flood, Meredith Rausch, Arthur Takahashi, and Stacy Kluge of Augusta University. Supporting faculty through the stressful and often frightening early days of the pandemic was an immense responsibility for those instructional designers tasked with the abrupt shift to remote instruction. This qualitative study analyzes the experiences of the five members of an instructional design team at a small US university as they designed and executed three training courses during the summer of 2020 to prepare faculty for online instruction during the COVID-19 pandemic. The authors use a phenomenological frame informed by sense-making theory to gain insight into the lived experiences of the instructional designers (IDs). The authors report that through a combined narrative and thematic analysis, they were able to make sense of the IDs' individual perspectives as part of a shared account. That collective account emphasized creating order out of chaos, coming together despite challenges associated with infrastructure, making sacrifices, and in the end, completing a task that seemed nearly impossible. Further, they found that the unsustainable stress and workload reveals the reality of laboring in crisis mode and highlights the need to plan for future emergencies.

Continuing with the theme of challenges during the pandemic is "College Students' Belonging and Loneliness in the Context of Remote Online Classes during the COVID-19 Pandemic" by Ashley Hansen-Brown, Sean Sullivan, Brianna Jacobson, Blake Holt, and Shaelyn Donovan of Bridgewater State University. The authors of this paper emphasize the longstanding literature on the importance of a sense of belonging for physical and emotional health and overall wellbeing. The pandemic was obviously a major challenge to cultivating a sense of belonging. The goal of this study was to document barriers to a sense of connection focusing on specific educational experiences in remote courses (e.g., use of camera, support from online faculty, and connection to classmates) as well as outside of higher education (e.g., job loss). Among a sample of 160 students, the authors identify significant correlations between online behaviors and students' sense of belonging, engagement, self-confidence, and loneliness. Perhaps most surprisingly, and contrary to the authors' predictions, belonging was negatively correlated with taking more synchronous classes in fall 2020. Another notable finding was that although interacting with peers in remote online classes had beneficial correlations for belongingness, it seems that interacting with professors may matter more. The paper includes a much deeper analysis than can be covered here, but overall raises important considerations for research, policy, and practice.

Another lens on student experiences during the pandemic is to examine the challenges faced by first-time online learners without any preparation. The next paper is "First-time Chinese Online Students' Expectations of Their Instructor in Fully Online Learning Environments" by Xi Lin of East Carolina University, which examines the experiences of this group of learners in the context of China, where fully online learning was not commonly practiced prior to the pandemic. The challenges associated with under preparation for online learning are significant. Research indicates that first-time online students often experience a high level of anxiety, which may negatively influence their learning, undermining both confidence and motivation that sometimes results in dropout. Additionally, there are cultural considerations in this international context. In contrast to Western cultures, which are frequently characterized as individualistic, and with small power distance between instructors and students, traditional Chinese culture is characterized by greater collectivism with considerable power differentials between students and faculty. These cultural traits influence classroom management, communication, teaching and learning approaches, and teacher-student relationships. The authors of this survey research seek to understand what first-time online students in China expect of their online instructors. One set of findings suggests that some expectations change in the shift to online learning. For example, the authors suggest that first-time online Chinese students do not believe being authoritative is an essential online instructor characteristic. In contrast to traditional classroom expectations, online learners may expect their instructors to listen to them, understand them, and build good classroom rapport. We have good reason to suspect that fulfilling these expectations will result in better outcomes in online education.

Understanding outcomes in online education settings is the subject of the next paper, "The Role of Evaluation Methods in Health-Related E-learning: A Rapid Review" by Jason Stemp, Urooj Khan, and James Boyd of La Trobe University, Australia, and Debannita Ghosh of Australian Catholic University. These authors note that while a growing proportion of workplace training is now conducted online and while many research reports indicate no significant differences in outcomes between online and place-based training, no standardised methods to evaluate the effectiveness of online learning have been established. Focusing on health-related fields, this paper describes the state of research to determine what evaluation methods are being used in online health training, the assets and deficits of these approaches, and which evaluation methods are appropriate for measuring the effectiveness of online education. The study includes a review of 30 articles from a ten-year period ending in 2021—focusing on health-related fields—from authors distributed around the world. The review thus endeavors to summarize research in this area and identify relevant evidence to help organizations develop learning interventions and measure the impact of student performance over time. The authors found that evaluation methods included student participation, students' reaction to the training program, self-efficacy, knowledge assessment, long-term performance, and the Kirkpatrick Evaluation Framework. They outline weaknesses associated with each of these and make recommendations for improving them. The authors conclude that while education evaluation tools and methods are helpful in assessing the efficacy of the training programs, the evidence reviewed here indicates that using any evaluation method in isolation is likely inadequate.

The authors of the next paper echo concerns about an over-reliance on a single method of evaluation to understand student performance in online education settings. In "Using LMS Log Data to Explore Student Engagement with Coursework Videos" authors Suzanne Maloney, Megan Axelsen, Linda Galligan, Joanna Turner, Petrea Redmond, Alice Brown, Marita Basson, and Jill Lawrence of the University of Southern Queensland, Australia, investigate the usefulness

of LMS log data as a reflection of student participation and engagement with video content in online education settings. The authors analyze and compare data from two platforms, an LMS (Moodle) and a video platform (Vimeo) used by the same courses. As in the previous paper, these authors find that the comparison shows differences in metrics and thus offers a caution to users relying on unidimensional metrics. The two different platforms used to collect student log data on video use (for the same video) often recorded quite different click counts. While the results support the view that log data do provide educators insights about student behaviors, the time and expertise in extracting, handling, and effectively using the data may be impractical for many online faculty.

The next article in this section is "Student Perceptions of Hybrid Courses in Higher Education" by Sanne Unger, Carrie Simpson, Alanna Lecher, and Shara Goudreau of Lynn University. The objective of this paper was to assess student perceptions of in-class and out-of-class assignments in hybrid courses. The authors sought to understand what students value most about these aspects of blended instruction. From a practical standpoint they also wanted to recommend ways to optimize advantages and limit disadvantages of each. Using longitudinal data with 191 students from multiple semesters the study concludes, in part, that students most value timely feedback and the ability to interact with classmates while in the classroom and the flexibility of online sessions. The authors also include implications of these results for practice in hybrid learning settings.

Learning can be described through a variety of psychological, emotional, and social processes and our next paper focuses on the latter of these three categories. In "Systematic Mapping of the Social Construction of Learning (2015-2020): Challenges for Online Learning Environments," authors Ruth-Elizabeth Minga-Vallejo of Universidad Técnica Particular de Loja, Ecuador, and María-Soledad Ramírez-Montoya of Tecnológico de Monterrey, Mexico, conduct a review of a variety of social dimensions of learning. Using a systematic review process, the authors identified 187 studies covering frameworks from communities of practice, communities of inquiry, to learning communities and more. The study maps when and where these articles were published, methodologies employed, who the authors are, and the citations they have generated, and concepts employed in addition to other dimensions of this important body of literature. Overall, this review provides the contours of an enormous and growing body of research highlighting the importance of socially interactive forms of online learning at various educational levels internationally.

The authors of the next paper, "The Role of Prior Online Learning Experience on Student Community of Inquiry, Engagement, and Satisfaction Scores by" Mohammad Shams Ud Duha, Jennifer C. Richardson, and Yukiko Maeda of Purdue University and Sevda Kucuk of Ataturk University, Turkey, also take on socially interactive forms of online learning as their topic. The Community of Inquiry (COI) framework seeks to describe, explain, and predict various instructional, social, and cognitive processes in interactive online environments. These authors hypothesize that learning to learn online is an important factor shaping student satisfaction and that prior online learning experiences might explain online student satisfaction and engagement, as well as ratings of the dimensions of the COI model. Some evidence suggests that prior online learning experience is correlated with increased student satisfaction, self-efficacy, motivation, and other variables important to learning, but other research finds that online learning experience can negatively influence student perceptions of course quality. This contradictory research suggests that students may become either more comfortable (positive) or more discerning (negative) as they become more familiar with effective course design. Using a sample of more

than 800 online learners, the authors find that online course experience has only a small association with specific subscales of the factors that were analysed – i.e., social presence and emotional engagement. The authors conclude that student satisfaction and perceptions of cognitive and teaching presence are not meaningfully related to prior online course experiences. Future research might investigate whether mediating variables influence this relationship. For example, does course quality shape the relationship between online experience and other outcomes? Perhaps more experienced students can better recognize a well-designed and facilitated course and are more satisfied in these than they are when enrolled in courses of lower quality design and facilitation.

The final paper in this section focuses on online language teaching. In "Learning How to Teach Languages Online: Voices from the Field," authors Carla Meskill of the University at Albany, State University of New York, Gulnara Sadykova of Kazan Federal University, Russian Federation, and Natasha Anthony of Hudson Valley Community College, investigate how online language teachers learn their craft. These authors note that while opportunities to engage in formal instruction in online language pedagogy are available through educational institutions and commercial agencies, research investigating the effectiveness of this instruction is limited. Through a combination of survey and interview methods with a sample of 171 online language instructors, the study reveals that respondents sought out learning with peers, through formal instruction, and through reflection to inform their online teaching. The study concludes that the social rather than technological nature of professional development for online language instruction should be a focus of future research and practice in this area.

We hope that these new investigations provide helpful insights for researchers and practitioners seeking understanding about how students and faculty learn, teach, and assess in online environments. We invite you to read, share, and cite this work and consider submitting your own rigorous original research to OLJ.

Online Verbal Argumentative Interaction (OVAI) in an Online Science Class During the COVID-19 Pandemic

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Abstract
As we begin the third decade of the twenty-first century, argument and debate are not habitual practices of university science education. This can be explained by the hegemony of instructor-centered traditional approaches in many of these practices. The Covid-19 pandemic has not only pushed university education online but also seems to provide an unforeseen opportunity to develop deep educational transformations. Here, we report on the case of a university online science course that, because of the Covid-19 crisis, used online verbal argumentative interaction (OVAI) to provide students with explicit opportunities to co-construct reason-based and/or evidence-based arguments and counterarguments in an undergraduate-centered science learning environment. The written arguments and counterarguments co-constructed by forty students (20 females and 20 males, 19–24 years old) during OVAI sessions were analyzed to determine their quality. Also, students' opinions about the use of OVAI in times of Covid-19 were documented. The results indicate that the students co-constructed high-quality arguments and counterarguments in the OVAI sessions. Most importantly, participants showed positive impressions about the use of OVAI in university online science education. The outcomes carry important educational implications considering the growing university online science courses in the pandemic and post-pandemic eras.

Keywords: Argumentative interaction, COVID-19, online education, higher science education, online verbal argumentative interaction.

As we begin the third decade of the twenty-first century, we should recognize that "argument and debate are virtually absent from university science education" (Archila et al., 2020, p. 647). Recently, in *The Routledge International Handbook of Student-Centered Learning and Teaching in Higher Education* (Hoidn & Klemenčič, 2021a), Chang et al. (2021) pointed out that argumentative interaction through class discussion (e.g., debate) should be considered one of the multiple key allies of student-centered learning environments. They clarify that this implies moving from instructor-centered learning to student-centered learning. It may be obvious to point out that traditional science instructor-centered practices provide university students with very few opportunities to cultivate their argumentative skills. Nevertheless, the point of concern here is that many universities make little empirical effort in considering how to transform their outmoded educational practices (Ashwin, 2020). Tan and Chen (2020) remind us that technologies are just tools for functional improvements. They contend that transformation implies going beyond the mere implementation of instructional tools or making a simple tweak to a traditional instructional method. To be precise, they define transformation as "making a significant change in *teaching* and *learning interactions* or learning mechanisms that aims at improving students' learning" (p. 2, italics added). In the current article, online verbal argumentative interaction (OVAI) is assumed as a form of teaching and learning interaction.

A common conclusion of the twenty articles included in the special issue of *Online Learning Journal,* entitled *The Covid-19 Emergency Transition to Remote Learning* (Jaggars, 2021), is that the Covid-19 pandemic has pushed online education forward. In the case of higher education institutions, Al-Salman and Haider (2021), Morgan et al. (2021), and Johnson and Barr (2021) explain that these institutions may take advantage of this crisis to identify deficiencies and accelerate reform of online education. Likewise, several scholars stress that the pandemic and post-pandemic eras seem to be an unforeseen opportunity to develop substantial transformations in university education (e.g., Archila et al., 2022; Corbera et al., 2020; Erduran, 2020; Hall, 2020). Arguably, the creation and consolidation of student-centered science educational scenarios can be a legitimate and desirable result of these transformations.

The Covid-19 Pandemic Pushes University Science Education Online

In this article the term "online education" refers to the educational experience in synchronous and/or asynchronous environments using computers, smartphones, tablets and/or other devices with Internet access (Zhu & Liu, 2020). Some academics have started to document the effects of the Covid-19 pandemic on education. One clear effect is that universities have rapidly pivoted to fully online education practices (not only in science). Sun et al. (2020), for example, discuss the results of a survey conducted among 39,854 students at Southeast University in China. An interesting finding was that respondents considered online interaction might be relevant to increase students' participation. Likewise, Sun et al. (2020) assert that this pandemic should be assumed by universities as an unforeseen opportunity (1) to rethink the belief that students are passive recipients and (2) to create genuine teaching and learning scenarios for explicit online interaction through open discussions.

In Jordan, Al-Salman and Haider (2021) surveyed 4,037 undergraduates to examine the respondents' attitudes towards online learning during the Covid-19 emergency. A key outcome was that only 25% of the students in the sciences ($n = 1,967$) considered "that the course objectives and learning outcomes have been achieved through distance learning with the same degree of effectiveness and efficiency as in face-to-face education" (p. 291). In Indonesia, Jariyah and Tyastirin (2020) administered an 11-item questionnaire ($N = 82$ students) to analyze the processes and constraints of Biology online learning amidst the Covid-19 pandemic in the Biology Study Program of UIN Sunan Ampel Surabaya. Interestingly, they found that 61 out of the 82 Biology students preferred direct face-to-face courses. Jariyah and Tyastirin (2020) consider that this and the fact some students had to pay for data packages, had unstable networks, and lack of practical activities are some of the reasons that can explain this result. According to Sun et al. (2020), it is common that instructors simply duplicate online the disciplinary content of traditional classroom lessons. Clearly, this can exacerbate traditional science instructor-centered practices. It is, therefore, rational and reasonable that some scholars consider that the Covid-19 crisis is an invaluable opportunity to create university student-centered online learning environments (e.g., Rapanta et al., 2020; Zhu & Liu, 2020).

In the present article, *student-centered online learning environment* is defined as an approach to promote authentic, meaningful, and deep learning through the combination of online instructional methods and activities in which students and their learning are placed at the heart of the process (Hoidn, 2017). Naturally, in this type of environment online, straight lecturing stops being the center. Accordingly, more time is devoted to online meaningful and intellectually challenging tasks and activities deliberately designed to engage students with content and active participation (Hoidn & Klemenčič, 2021b). Jacobs et al. (2016) divide student-centered learning into ten overlapping elements that informed our study. We briefly describe them as follows:

(1) Students and instructors as co-learners—Instructors change their unquestioned authoritarian role and look forward to learning along with students.
(2) Student-student interaction—Students are provided with opportunities to share with their peers.
(3) Student autonomy—Students become lifelong learners; they are accountable for their educational process and become less dependent on instructors.
(4) Focus on meaning—Students strive to develop genuine and meaningful understanding of what they are studying.
(5) Curricular integration—Students perceive a clear integration between the topics, subjects, and the wider world.
(6) Diversity—Various learning activities are created to meet the needs of all students and to guide them in differentiating their different purposes.
(7) Thinking skills—Students are challenged to go beyond the information treated in the course, being helped to give examples, explain, debate, and criticize the views of others in order to enrich their thinking skills.
(8) Alternative assessment—Different nontraditional forms of assessment practice are adopted, such as (formal and informal) formative assessment, peer assessment, and self-assessment.

(9) Learning climate—Instructors strive to create an atmosphere in which all students spontaneously participate, ask questions, and communicate their viewpoints in content-related discussions.

(10) Motivation—Instructors foster authentic motivation and encourage students to motivate themselves, their peers, and their instructors to learn.

These ten elements give us an idea of how complex it is to create a student-centered learning environment. Therefore, it is not surprising that Jacobs et al. (2016) recommend small steps rather than one revolutionary leap to shift from science instructor-centered learning to student-centered learning. By the same token, Hoidn and Klemenčič (2021b) underscore the need to take concrete actions to make student-centered learning practices a reality rather than just rhetoric. In the next section, we shall discuss the main characteristics of OVAI and argue that this can be considered as a concrete action in a student-centered online learning environment.

Main Characteristics of OVAI

In his book, *Improving How Universities Teach Science*, Nobel laureate Carl Wieman (2017) criticizes the hegemony of the traditional science instructor-centered model adopted by many universities and invites us to transform university science education. According to Jacobs et al. (2016), activities involving student-student interaction can result in greater benefits, such as higher order thinking (e.g., argumentation, critical thinking, problem solving) and higher self-esteem. Also, they emphasize that these should be one of the various regular activities of student-centered learning environments. Unfortunately, "only a minority of students in secondary and postsecondary education receive direct and explicit instruction in argumentation" (Quintana & Correnti, 2019, p. 1133). At this point, it is important to clarify some key terms. In the present article, argumentation is considered as a scientific practice with the goal of "justif[ying] claims with reasons and/or evidence" (Erduran et al., 2022, p. 1). We use the term "reason" to refer to "the cause of an event or situation or something that provides an excuse or explanation" (Cambridge Dictionary 2021). Moreover, in this article the term "evidence" refers to "the facts, signs, or objects that make you believe that something is true" (Oxford English Dictionary 2021).

Within this perspective, the elaboration of reason-based and/or evidence-based arguments (and counterarguments) is an important aspect of authentic argumentative practices. An example of a reason-based argument is presented by Erduran et al. (2022) as follows: "Day and night occur because of a spinning earth" (p. 2). With respect to evidence-based argument, an example is communicated by Archila et al. (2020, p. 650): "Fever of 311.15 K (38 °C) and higher during the first 10 days following delivery or miscarriage is a key symptom" that can be used to diagnose puerperal fever. Archila (2015a) categorizes argumentation as a "cognitive-linguistic skill" due to its intellectual and communicative nature. Similarly, Plantin (2018) states that the goal of argumentation is to construct and communicate arguments in a rational and reasonable way. Moreover, he outlines that argumentation is a communicative and interactional act. With this in mind, we define "argumentative interaction" as a verbal and/or written communication in which two or more people exchange and/or co-construct arguments in a dialogic—egalitarian (symmetric) dialogue—atmosphere. For this article, "online verbal argumentative interaction" (OVAI) refers to verbal argumentative interaction that is mediated by the Internet.

As mentioned in the introduction to this article, the traditional science instructor-centered model is one of the major obstacles to success in implementing argumentative interaction in university science courses. There are various reasons that explain the hegemony of this model. First, some science instructors hold the following limited (and naïve) view of the teaching and learning process: "If I [we] know the subject well, I [we] can also teach it" (Kampourakis, 2017, p. 202). Second, in many universities around the globe, very few science instructors hold a degree in education (either an undergraduate degree or a postgraduate qualification) (Archila & Truscott de Mejía, 2020). Third, in many universities, to hold a degree in education is not considered an indispensable requirement to become a science instructor. The consequence of this is that many university students are enrolled in university science courses in which the instructors are experts in their field (e.g., astronomy, geosciences, physics). Nonetheless, they are certainly not experts in the *teaching* and *learning* of their field. To deal with this inconsistency, Kampourakis (2017) and Wieman (2017) have proposed deep and permanent collaboration between science education specialists and science instructors. Also, Wieman (2017) stresses that the instructors' use of evidence-based teaching practices in their courses should be imperative. As Archila (2014, 2017a), Uzuntiryaki-Kondakci et al. (2021), and Pabuccu and Erduran (2017) have demonstrated, even pre-service science teachers are not usually prepared to promote argumentation.

Argumentative interaction is a valuable opportunity to engage university students in the co-construction of reason-based and/or evidence-based arguments and counterarguments when they debate in small groups. This type of interaction provides students with genuine opportunities to construct better-argued and more informed and critical views on science-related issues. To this end, it is fundamental that the instructor encourages them to co-construct reason-based and/or evidence-based arguments rather than that each group member imposes her/his viewpoint (Baker et al., 2020; Schwarz & Baker, 2017). Bova (2017) has studied the instructor's role in fostering argumentative interaction in higher education. He underscores the importance of the types of questions used by the instructor to engage students in argumentative interaction. Similarly, Archila (2017b) and Archila et al. (2021a) provide evidence for the claim that argumentative interaction is more productive when students are presented with questions in which diversity of reason-based and/or evidence-based arguments and counterarguments are possible.

At this point, an important question to ask is how it is possible to formulate questions that facilitate argumentative interaction. Baker (2002, 2003) has proposed five conditions that can prove useful for instructors to better engage students in argumentative interaction, namely:

(1) Diversity of proposals or viewpoints should exist relating to an issue (e.g., collaborative problem, controversial question, open-ended question)—there is no "right" answer, method, or solution to this issue.
(2) Two different proposals, at least, should exist in the same small group—these provide group members with the opportunity to evaluate evidence to determine which proposal is more plausible.
(3) Each proposal should be plausible (reasonable)—this elicits students' deep understanding.

(4)　Each small group should be asked to decide (e.g., choose one proposal)—this condition makes it possible for students to evaluate and criticize the argumentation of the other group members.

(5)　When choosing one proposal, each small group should carefully examine the arguments and counterarguments of the decision made—this provides students with a final opportunity to evaluate the plausibility of the proposal selected.

Previous studies have confirmed the coherence and usefulness of these conditions (Clark & Sampson, 2008; Clark et al., 2007; Jiménez-Aleixandre & Brocos, 2017). Archila (2015b, 2017b) and Archila et al. (2018, 2020, 2021a) have corroborated the usefulness of these five conditions after adopting them in the formulation of argumentative questions as a way to engage students in face-to-face (offline) argumentative interactions. In the present study, we use these in OVAI. We claim that OVAI can be a means to provide students with explicit opportunities to co-construct reason-based and/or evidence-based arguments and counterarguments. This claim emerges as a response to Namdar and Namdar's (2021) call to give students opportunities to not only develop arguments but to go further by means of the formulation of counterarguments. They explain that this is fundamental to help students avoid adopting biased attitudes when making decisions. Naturally, this vision is incompatible with traditional science instructor-centered practices. Hence, an effective implementation of Baker's (2002, 2003) five conditions in OVAI practices that result in explicit opportunities for students to co-construct reason-based and/or evidence-based arguments and counterarguments requires student-centered online learning environments (Jacobs et al., 2016). In our case, we decided to include OVAI as one of the multiple types of activities of an undergraduate-centered science learning environment that will be discussed later.

Research Questions

The aim of the present study is to provide evidence for the claim that OVAI can be used to give students explicit opportunities to co-construct reason-based and/or evidence-based arguments and counterarguments when an undergraduate-centered science atmosphere is created. Our study is a realistic contribution to transforming university online science education. Specifically, the study seeks answers to the following two research questions:

(1)　Can OVAI be used to provide students with explicit opportunities to co-construct reason-based and/or evidence-based arguments and counterarguments?

(2)　What is the opinion of the students about the use of OVAI in university online science education?

Methods

Setting

This research was carried out in a highly academic-ranked private university located in Bogotá, Colombia. Due to the Covid-19 pandemic, this higher education institution speeded up the implementation of online education. The university decided to assume this pandemic as an unforeseen opportunity to launch an ambitious plan to enhance its educational practices. Some of the concrete actions included the following: the robustness of the learning management system, Blackboard Learn™, changes in the evaluation methodologies prioritizing formative over summative assessment practices, and most importantly, permanent training and support to instructors not only in technological-related skills, but also in the creation, implementation, and assessment of activities for their online courses.

Before intervention start-up, permission was obtained from the University's Ethics Committee. We applied "convenience sampling" (Bryman, 2016, p. 187) and implemented our strategy in a science course in which the last author is the course instructor. This medium (40-60 students per semester) undergraduate course was called Food Microbiology. This course was taught over a 16-week period and consisted of lectures (two per week, 75 min each) and a practical laboratory session (one per week, 120 min). It was usually taken by undergraduates of different ages, who were studying different majors (e.g., Microbiology, Food Engineering, Chemical Engineering). The Food Microbiology course was offered initially in an online format. The course information, tools (e.g., audio and video recordings of the lectures), and assignments were available for the undergraduate students in Blackboard Learn™, while Zoom®—a video conferencing software app—was used for lectures and OVAI.

Participants

Of fifty eligible undergraduates enrolled in the Food Microbiology course, forty (80%) participated in this study. Out of these 40 participants, 20 were female and 20 were male. Most of the participants at the time of data collection were in their early 20s (M = 21.0; SD = 1.30). All participation was voluntary and, as required by the University's Ethics Committee, participants gave their consent for participation in writing. Students were informed about the aims of the project. It was emphasized that they could stop participating in the study whenever they wanted, and they were informed that their viewpoints and answers would have no influence on their final course grade.

Intervention

Throughout this article, we claim that the Covid-19 crisis is an unforeseen opportunity to use OVAI to provide students with explicit opportunities to co-construct reason-based and/or evidence-based arguments and counterarguments in an undergraduate-centered science learning environment. Thus, in this section we describe the main features of the student-centered science learning environment created and implemented in the Food Microbiology course. Our learning environment (Figure 1) was informed by the ten elements proposed by Jacobs et al. (2016) and discussed earlier. The activities (e.g., group project, laboratory work, OVAI) were deliberately designed to place students and their learning at the center of the process. A group project was the main activity.

The students worked in small groups (4-5 students) throughout the course to do a project together in which they proposed an innovative solution to treat (control) a microorganism (e.g., *Clostridium botulinum*, *Staphylococcus aureus*) (freely chosen by each group) in the food industry (e.g., the dairy sector, fruit, and vegetable industry). We created this main activity as a co-learning scenario to support the instructor learning along with the students, as well as curricular integration, and the development of genuine and meaningful understanding of what students were studying (focus on meaning). Workshops, laboratory works, Padlet®, formative assessment, and OVAI were the activities created to help students develop their innovative solutions as part of the main activity (group project). Padlet® is an online platform on which students can post observations about any topic treated in the course (e.g., nature of microbiology, toxins found in food).

Figure 1
Our Undergraduate-Centered Science Learning Environment. Numbers Indicate the Ten Elements Proposed by Jacobs et al. (2016).
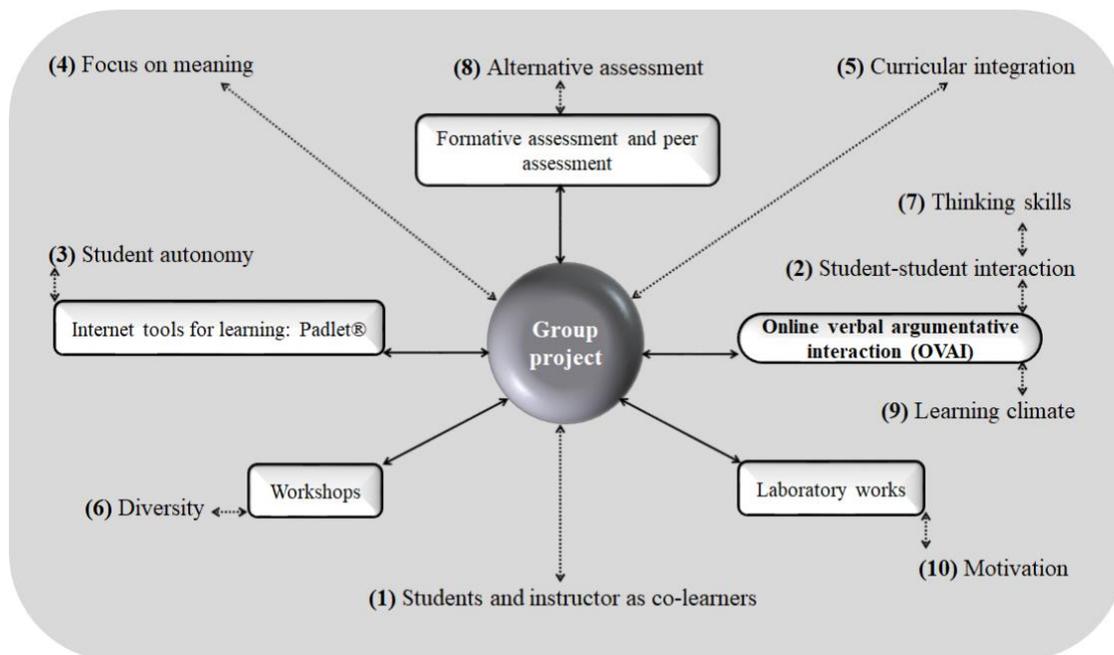
Each type of activity was associated with at least one of the ten elements of student-centered learning proposed by Jacobs et al. (2016) (Figure 1). Nevertheless, as they remind us, these are "overlapping elements" (p. xiv) which means that this association is only informative because the same element (e.g., motivation) is, of course, involved in more than one activity. In this article, we report on one activity: OVAI. A total of four OVAI sessions (Weeks 4, 6, 12, and 14) were organized over the 16-week period of the Food Microbiology course. In these sessions, video conferencing features were used to divide the class into small groups. Each small group was asked to decide about an argumentative question (four in total).

It was explained to the participants that the requirement that each group should make a single decision implied reaching a consensus as far as possible, and perhaps most importantly, they were asked to evaluate the arguments for and against presented by each small group member to co-construct small-group arguments and counterarguments. Clearly, this implies a challenge that should motivate participants' argumentation involving deliberation. Each small group was also asked to report in writing the group decision as well as the arguments and counterarguments which had been co-constructed. The four argumentative questions presented to the students were as follows:

(1) What could be an effective and feasible home food preservation technique? (OVAI session 1, Week 4, Topic: Food preservation methods).

(2) Which technique would you recommend for the identification of microorganisms in food? (OVAI session 2, Week 6, Topic: Testing methods in food microbiology).

(3) Think about a pathogen that affects fish or shellfish and the method employed by a specific country to prevent or control it. In your opinion, is this method rational and reasonable? (OVAI session 3, Week 12, Topic: Microbiology of food products of animal origin).

(4) Choose two fruits and/or vegetables. In your view, which are the greater sources of contamination in the agricultural production-consumption chain of such fruits and/or vegetables? (OVAI session 4, Week 14, Topic: Microbiology of fruits and vegetables).

The role of the instructor in these OVAI sessions was to encourage the undergraduates, while maintaining her neutrality throughout to avoid influencing students' decisions. In each OVAI session (in total four), small groups were given 45-60 min (in total 180-240 min) of the 75-min lecture to discuss and report in writing the decision made and the co-constructed arguments and counterarguments. At this stage, it is important to clarify that the number of members of each group varied to give students the opportunity to interact with different partners. Specifically, in OVAI sessions 1, 2, and 4, small groups consisted of 5-6 students while 2-3 was the number of participants in small groups in the third OVAI session.

Research Design

Data Collection

The data corpus is composed of the arguments and counterarguments co-constructed by each small group during the four OVAI sessions as a response to the four argumentative questions and reported in writing. Each small-group writing is assumed as a concrete product of each OVAI session. The data also include the participants' responses to an anonymous 11-item feedback survey (Appendix) adapted from previous surveys about the promotion of argumentation in higher science education (Archila et al., 2018, 2020, 2021b). It was self-administered (5-8 min) in the last session of the Food Microbiology course through the survey administration app, Google Forms™.

The purpose of this instrument was to find out about the students' opinion relating to the use of OVAI during Covid-19, and thus receive valuable feedback from participants for future improvements in the promotion of OVAI in the pandemic and post-pandemic eras. Instrument completion was voluntary. Thirty-two out of the 40 participating students answered the survey.

Data Analysis

In order to answer the first research question, "Can OVAI be used to provide students with explicit opportunities to co-construct reason-based and/or evidence-based arguments and counterarguments?", and to arrive at valid conclusions from arguments and counterarguments co-constructed in OVAI sessions and reported in written mode, we adopted a *magnitude coding method*—commonly used to indicate the variable characteristics of data such as intensity, presence, or evaluative content (Saldana, 2021). To be precise, we used a single valid-invalid evaluative content. Table 1 shows the six codes used. The coding was conducted independently by the first and the last author. Cohen's kappa coefficient (Cohen, 1960) calculated was 0.61 for OVAI session 1 (Week 4); 0.80 for OVAI session 2 (Week 6); 0.77 for OVAI session 3 (Week 12); and 1.00 for OVAI session 4 (Week 14). According to Bryman (2016, p. 276), "a coefficient of 0.75 or above is considered very good; between 0.6 and 0.75, it is considered good" inter-coder agreement. All discrepancies were discussed, and a consensus was reached after further examination of the corpus. Additionally, the first and the last author classified independently the arguments and counterarguments co-constructed by the participants into two categories, namely "reason-based" and "evidence-based" (Table 2). Kappa coefficient calculated was 0.66 for OVAI session 1 (Week 4); 0.64 for OVAI session 2 (Week 6); 0.70 for OVAI session 3 (Week 12); and 0.82 for OVAI session 4 (Week 14).

Table 1
Rubric Used in the Coding Data of the Quality of the Arguments and Counterarguments Co-Constructed

Code	Description
1A = Low quality	More than one of the arguments co-constructed is invalid
2A = Satisfactory quality	One of the arguments co-constructed is invalid
3A = High quality	All the arguments co-constructed are valid
1C-A = Low quality	More than one of the counterarguments co-constructed is invalid
2C-A = Satisfactory quality	One of the counterarguments co-constructed is invalid
3C-A = High quality	All the counterarguments co-constructed are valid

A Argument, *C-A* Counterargument

Table 2

Rubric Used in the Coding Data of the Nature of the Arguments and Counterarguments Co-Constructed

Code	Example
1R-BA = Reason-based argument	"Freezing of food is a good preservation method because the enzymes of some microorganisms do not work at low temperatures, so their functions will be affected, and thus its growth in food will be inhibited" (Small-group 4, OVAI session 1, Week 4, Topic: Food preservation methods).
1R-BCA = Reason-based counterargument	"Freezing of food only stops the growth of microorganisms, but there is no elimination of these" (Small-group 4, OVAI session 1, Week 4, Topic: Food preservation methods).
2E-BA = Evidence-based argument	"It has been demonstrated that the use of organochlorine and organophosphate pesticides is an effective way for treating the pathogen: *Argulus japonicus*" (Small-group 2, OVAI session 3, Week 12, Topic: Microbiology of food products of animal origin).
2E-BCA = Evidence-based counterargument	"Evidence suggest that the use of organophosphate pesticides is expensive and harmful to the environment and the host" (Small-group 2, OVAI session 3, Week 12, Topic: Microbiology of food products of animal origin).

Finally, to answer the second research question, "What is the opinion of the students about the use of OVAI in university online science education"? the participants' responses to Questions 1 to 5 of the online anonymous survey (Appendix) were analyzed using "frequency of occurrence" (Erickson, 2012, p. 1462). In order not to exceed the word limit for this article some answers to open-ended questions 2 and 4 are briefly commented on in the Results section. Moreover, responses to Questions 6 to 11, were placed on a rating scale range of frequency from Strongly Disagree (1) to Strongly Agree (5). To measure the internal consistency reliability of these questions, the Cronbach's alpha coefficient was calculated using the *Statistical Package for the Social Sciences* (SPSS®). The coefficient obtained was 0.97. According to George and Mallery (2020), this value corresponds to an "excellent" (p. 244) internal consistency.

Results

The findings are presented in two sections. The first section deals with the outcomes of the arguments and counterarguments co-constructed in small groups during the four OVAI sessions, while the second section reports the results of the 11-item anonymous survey that asked for the students' opinions about the OVAI sessions.

Quality and Type of Arguments and Counterarguments Co-Constructed in Small Groups

As previously mentioned, in the four OVAI sessions students interacted argumentatively in small groups. The number of members per group varied depending upon the session. For example, 14 small groups were organized for OVAI session 1, while 6 small groups were organized for OVAI session 4. As explained earlier, the purpose of this variation was to foster the interaction of students with different partners in variable membership proportions, and thus facilitate the presence of diverse viewpoints and counterarguments. Table 3 shows the quality of the arguments and counterarguments reported in writing by participating students as product of the co-construction process carried out in each of the four OVAI sessions.

Table 3
Quality of the Arguments and Counterarguments Co-Constructed in Small Groups in Each OVAI Session

	Arguments			Counterarguments		
	Low	Satisfactory	High	Low	Satisfactory	High
OVAI session 1 (Week 4–Food preservation methods)						
Small-groups ($n = 8$)	1	2	5	1	-	7
OVAI session 2 (Week 6–Testing methods in food microbiology)						
Small-groups ($n = 9$)	1	3	5	1	3	5
OVAI session 3 (Week 12–Microbiology of food products of animal origin)						
Small-groups ($n = 14$)	2	2	10	2	-	12
OVAI session 4 (Week 14– Microbiology of fruits and vegetables)						
Small-groups ($n = 6$)	-	1	5	-	-	6

It is interesting to note that OVAI session not only provided students with explicit opportunities to co-construct arguments and counterarguments, but also offered them a scenario in which most of the small groups co-constructed satisfactory or high-quality arguments and counterarguments. Perhaps most importantly, these outcomes (Table 3) indicate that many small groups went further to co-construct valid counterarguments. In other words, they answered the argumentative question (e.g., Which technique would you recommend for the identification of microorganisms in food?) in each OVAI session, based on reasons and/or evidence rather than on biased views. This assertion is corroborated by the results displayed in Table 4. These outcomes suggest that the small-groups effectively co-constructed reasons and/or evidence arguments and counterarguments. We found that participants tended to co-construct more reason-based arguments and counterarguments than evidence-based arguments and counterarguments. It is important to clarify that this trend is just informative and cannot be assumed as an indicator to assess the quality of the co-constructed arguments and counterarguments.

Erduran et al. (2022) remind us that the type (reason-based or evidence-based) of the argument does not determine its quality. In our case, we consider that the nature of the four argumentative questions that stimulated the four OVAI sessions could have contributed to the formation of this reason-based (counter) arguments trend.

Table 4
Type of Arguments and Counterarguments Co-Constructed in Small Groups

	Arguments		Counterarguments	
	R-B	E-B	R-B	E-B
OVAI session 1 (Week 4–Food preservation methods)				
Small-groups (*n* = 8)	7	5	7	4
OVAI session 2 (Week 6–Testing methods in food microbiology)				
Small-groups (*n* = 9)	9	1	9	1
OVAI session 3 (Week 12–Microbiology of food products of animal origin)				
Small-groups (*n* = 14)	13	5	13	5
OVAI session 4 (Week 14– Microbiology of fruits and vegetables)				
Small-groups (*n* = 6)	6	3	6	2

R-B Reason-based (counter) argument, *E-B* Evidence-based (counter) argument

Students' Opinions About the OVAI Sessions

Switching from instructor-centered learning to student-centered learning is a *sine qua non* condition among many, to implement argumentative interaction practices in higher education (Hoidn & Klemenčič, 2021b; Jacobs et al., 2016). Accordingly, we created and implemented an undergraduate-centered science learning environment in which OVAI is one of the multiple activities deliberately designed to place students and their learning at the center of the process (Figure 1). Importantly, our online learning environment was pushed forward by the Covid-19 crisis. For all the reasons just mentioned, it makes sense to report the impressions of the participating students about the OVAI sessions. A first result of the 11-item survey to mention here is that 26 out of the 32 participants who completed the instrument had received instruction in argumentation before taking the Food Microbiology course (Question 1 in Appendix). Although one would assume that this is a favorable contextual factor for instructors to become more interested in the implementation of argumentative interaction scenarios, the reality does not necessarily support this assumption. The reality shows that 14 out of the 32 respondents never (2/32) or infrequently (12/14) had the opportunity to participate in student-student OVAI sessions in other university online courses in times of Covid-19 (Question 5 in Appendix). Therefore, the data collected from Question 5 is important for two reasons. First, these suggest that student-student OVAI was not adopted by as many instructors as expected during in the Covid-19 emergency transition to online learning (Al-Salman & Haider, 2021). And second, they reaffirm Sun et al.'s (2020) idea that most of the instructors carried out this transition attached to traditional science instructor-centered practices.

Another key finding is that nearly all the respondents (29/32) considered that the Food Microbiology course provided them with opportunities to interact argumentatively with their partners (Question 2 in Appendix). As shown in the comments that follow, participating students appreciated the fact that this course gave them opportunities to interact and discuss various topics. Such opportunities seemed to be almost inexistent in other courses. Some of the comments were: "It was important to discuss and interact with people from different areas"; "I had the opportunity to debate about specific topics of the course via Zoom, I liked this so much"; and "in other courses, small-groups discussion activities do not exist, this has been probably the second course in which I have got engaged in small-groups discussion, and I am already in 7th semester." In view of these comments, it is certainly not surprising that all the respondents of the survey considered that the sessions of argumentative interaction with their partners were useful for them (Question 4 in Appendix). It is interesting to note that undergraduates perceived the utility of argumentative interaction to enrich their learning process as illustrated in the following opinions: "It was useful to achieve deep understanding"; "I could get to know new ideas and perspectives that I had not considered"; and "there were concepts that my partners understood better than me, therefore discussing with them helped me to better understand their ideas. Moreover, some of them were microbiology students who had clearer previous knowledge that was very helpful." Even though these are promising impressions, 14 out of the 32 participants who answered the survey mentioned that "little time to discuss" was one of the difficulties they found when interacting argumentatively with their partners. Other difficulties included the following: an unstable network (7/32) and mastery of scientific knowledge (6/32) (Question 3 in Appendix).

In closing, Table 5 displays the respondents' average scores along with the standard deviations on questions 6 to 11 of the anonymous survey (Appendix). The maximum possible average score for each item was 5. The results indicate that the average scores varied between 3.68 and 4.06 with a mean of 3.88 which corresponds to the "agree" choice (Bringula et al., 2012, p. 1073). This suggests that the students appeared to have positive impressions about the implementation of OVAI practices in the Food Microbiology course.

Table 5
Descriptive Statistics of Survey Questions 6 to 11

Question	Mean	SD	Cronbach's alpha if item deleted
6. I liked the student-student OVAI sessions	3.81	1.22	0.960
7. The student-student OVAI sessions helped me to develop deep learning	3.87	1.23	0.963
8. The student-student OVAI sessions were an opportunity to practice my argumentation skills	3.68	1.17	0.968
9. The student-student OVAI sessions helped me become aware of my learning process	3.90	1.14	0.964
10. Student-student OVAI sessions should continue to be promoted in the Food Microbiology course	4.06	1.21	0.962
11. Student-student OVAI sessions should be promoted in other university online courses as well	4.00	1.24	0.967

Discussion and Educational Implications

Several scholars writing about the COVID-19 crisis have called for the implementation of research-based change in educational practices (Archila et al., 2022; Corbera et al., 2020; Erduran, 2020; Hall, 2020; Sun et al., 2020). In this sense, Erduran (2020) maintains that "the pandemic context has reiterated the importance of promoting students' understanding of uncertainty in science, acquisition of critical thinking skills, as well as the ability to engage in argumentation and problem-solving" (p. 488). Consequently, in this article we report on the case of a university online science course that, pushed forward by the Covid-19 pandemic, implemented OVAI practice to provide students with explicit opportunities to co-construct reason-based and/or evidence-based arguments and counterarguments in a student-centered science learning environment. In this section, the results are discussed in the light of the literature. Moreover, educational implications are presented in relation to the two research questions that guided this study.

Regarding the first research question— "Can OVAI be used to provide students with explicit opportunities to co-construct reason-based and/or evidence-based arguments and counterarguments"? —an overview of the results showed that participating students co-constructed valid arguments and counterarguments in small groups when explicit opportunities were given in the form of the OVAI session (Table 3). All four OVAI sessions were fruitful for this co-construction. The planning process of these sessions was inspired by the five conditions proposed by Baker (2002, 2003) and described earlier. Therefore, the positive results reported here reinforce the idea that Baker's (2002, 2003) conditions offer a pragmatic and effective framework for those instructors interested in the implementation of argumentative interaction scenarios in their courses (Archila, 2015b, 2017b; Archila et al., 2020, 2021a; Clark & Sampson, 2008; Clark et al., 2007; Jiménez-Aleixandre & Brocos, 2017). In this regard, the contribution of our study is that it provides research evidence to demonstrate the usefulness of Baker's (2002, 2003) conditions to engage students in the co-construction not only of arguments but also of counterarguments. This is an authentic contribution if we acknowledge the need to give students opportunities to not only construct arguments, but to value diverse viewpoints and anticipate counterarguments (Erduran et al., 2022, Namdar & Namdar, 2021).

Erduran et al. (2022) insist that the formulation of reason-based and/or evidence-based arguments is a fundamental aspect of the argumentative process. Results showed that the small-group decisions students made during OVAI sessions were supported by both reasons and evidence (Table 4). This suggests that these sessions were an explicit opportunity for undergraduates not only co-construct valid arguments and counterarguments, but also to diversify the nature of these. Thus, it is plausible to suggest that OVAI can be used to help students to become engaged in the practice of "the meta-linguistic features of argumentation (claims, reasons, evidence, and counterargument)" (Osborne, 2010, p. 466). It is relevant to remember that OVAI was one of various activities of an undergraduate-centered science learning environment. Two implications emerge from these results. First, policymakers and stakeholders should take more account of Chang et al.'s (2021) invitation to abandon the instructor-centered learning approach.

Second, instructors should be trained, guided, and supported in the creation, implementation, and evaluation of student-centered face-to-face and online learning environments for the post-pandemic era. Importantly, as Kampourakis (2017) and Wieman

(2017) assert, much of the success of this transformation process is determined by permanent collaboration between science instructors and science education specialists.

The fact that the encouraging results of the OVAI sessions have been obtained in a student-centered learning environment supports what Chang et al. (2021) and Jacobs et al. (2016) have noted, namely, that student-student argumentative interaction should be considered one of the multiple key allies of student-centered learning environments. One implication here is that the creation of this type of environment in the post-pandemic era should be guided by research-based frameworks. In our case, Jacobs et al.'s (2016) ten elements inspired our environment (Figure 1). In the twenty-first century, this implication may seem obvious at first glance. Nonetheless, "a look in many classrooms today shows a predominance of teacher centered practices" (Jacobs et al., 2016, p. xiv).

Regarding the second research question— "What is the opinion of the students about the use of OVAI in university online science education"? —the results of the 11-item survey revealed that, in general, students seemed to have positive opinions about the OVAI sessions. This is consonant with a key result of the survey reported by Sun et al. (2020) in China: respondents were aware of the importance of online interaction in higher education practice in times of Covid-19. Unfortunately, we found that undergraduates' opportunities to become engaged in student-student OVAI are still limited in other university online courses, even in times of Covid-19. Interestingly, this issue of concern has been reported in previous studies focused on face-to-face educational practices before the Covid-19 pandemic (Archila et al., 2020; Pabuccu & Erduran, 2017; Quintana & Correnti, 2019). Recently, Erduran et al. (2022) presented us with the following paradox formulated in the pre-pandemic era: Instructors tend to consider argumentation as important, but they rarely include activities such as "debate, valuing different positions and getting students to anticipate in counterarguments" (p. 12) in their science courses. It is, therefore, plausible to suggest that our results reaffirm Sun et al.'s (2020) contention: The response of some university courses to the Covid-19 crisis was merely to duplicate online the outmoded traditional instructor-centered practices.

Limitations and Scope for Future Research

Four serious limitations of this study should be acknowledged. The main limitation is the lack of a control group. Undoubtedly, more robust evidence would have been produced if we had had the opportunity to compare our results with those of a control group. Second, our sample size is quite small (forty participants). Hence, caution needs to be taken regarding the generalizability of our outcomes which are exploratory, preliminary, and tentative. Third, more than half of the undergraduates had received previous instruction in argumentation. This situation could have influenced the co-construction of arguments and counterarguments. It would be interesting to design and conduct replication studies with students who have not received previous instruction in argumentation to enrich the corpus.

The fourth limitation is that we implemented our strategy in only one Food Microbiology course in a Colombian university. Exploring the use of OVAI to give students explicit opportunities to co-construct reason-based and/or evidence-based arguments and counterarguments in other online undergraduate-centered science learning environments, in other universities, and in other countries is critical to establish additional validity.

Much work remains to be done in relation to the creation of genuine and meaningful OVAI scenarios. Thus, the results reported here are certainly far from infallible. Due to the

growing number of university online science courses in the pandemic and post-pandemic eras, there is a need for additional research related to the design of pragmatic and effective OVAI activities in which students can enrich their argumentation skills. Also, more research on how to productively use OVAI to promote the co-construction of reason-based and/or evidence-based (counter) arguments with graduates and undergraduates from multiple education majors (not only science) would help to better understand the ways in which OVAI could be implemented in accordance with the nature of each discipline (e.g., Anthropology, Architecture, Chemistry).

Declarations

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References

Al-Salman, S., & Haider, A. S. (2021). Jordanian university students' views on emergency online learning during COVID-19. *Online Learning*, *25*(1), 286–302. https://doi.org/10.24059/olj.v25i1.2470

Archila, P. A. (2014). *Comment enseigner et apprendre chimie par l'argumentation?* Éditions Universitaires Européennes.

Archila, P. A. (2015a). Uso de conectores y vocabulario espontaneo en la argumentación escrita: Aportes a la alfabetización científica. *Revista Eureka sobre Enseñanza y Divulgación de las Ciencias*, *12*(3), 402–418. http://hdl.handle.net/10498/17599

Archila, P. A. (2015b). Using history and philosophy of science to promote students' argumentation. A teaching–learning sequence based on the discovery of oxygen. *Science & Education*, *24*(9), 1201–1226. https://doi.org/10.1007/s11191-015-9786-2

Archila, P. A. (2017a). Représentations des enseignants débutants de chimie sur l'argumentation : Les relations avec le développement des travaux pratiques. In P. Membiela, N. Casado, M. I. Cebreiros, & M. Vidal (Eds.), *La enseñanza de las ciencias en el actual contexto educativo* (pp. 17–21). Educación Editora.

Archila, P. A. (2017b). Using drama to promote argumentation in science education. *Science & Education*, *26*(3-4), 345–375. https://doi.org/10.1007/s11191-017-9901-7

Archila, P. A., & Truscott de Mejía, A.-M. (2020). Bilingual university science courses: A questionnaire on professors' practices and espoused beliefs. *International Journal of Bilingual Education and Bilingualism*, *23*(2), 132–152. https://doi.org/10.1080/13670050.2017.1334756

Archila, P. A., Molina, J., & Truscott de Mejía, A.-M. (2018). Using formative assessment to promote argumentation in a university bilingual science course. *International Journal of Science Education*, *40*(13), 1669–1695. https://doi.org/10.1080/09500693.2018.1504176

Archila, P. A., Molina, J., & Truscott de Mejía, A.-M. (2020). Using historical scientific controversies to promote undergraduates' argumentation. *Science & Education*, *29*(3), 647–671. https://doi.org/10.1007/s11191-020-00126-6

Archila, P. A., Molina, J., & Truscott de Mejía, A.-M. (2021a). Using a controversy about health, biology, and indigenous knowledge to promote undergraduates' awareness of the importance of respecting the traditions and beliefs of indigenous communities: The case of paragonimiasis in Colombia. *Cultural Studies of Science Education, 16*(1), 141–171. https://doi.org/10.1007/s11422-020-09978-4

Archila, P. A., Molina, J., & Truscott de Mejía, A.-M. (2021b). Fostering bilingual written scientific argumentation (BWSA) through collaborative learning (CL): Evidence from a university bilingual science course. *International Journal of Science Education*, *43*(1), 1–29. https://doi.org/10.1080/09500693.2020.1844922

Archila, P. A., Restrepo, S., Truscott de Mejía, A.-M., Rueda-Esteban, R., & Bloch, N. I. (2022). Fostering instructor-student argumentative interaction in online lecturing to large groups: A study amidst the Covid-19 pandemic. *Revista Eureka sobre Enseñanza y Divulgación de las Ciencias*, *19*(1), 1–16. https://doi.org/10.25267/Rev_Eureka_ensen_divulg_cienc.2022.v19.i1.1101

Ashwin, P. (2020). *Transforming university education: A manifesto*. Bloomsbury Publishing.

Baker, M. J. (2002). Argumentative interactions, discursive operations and learning to model in science. In P. Brna, M. Baker, K. Stenning, & A. Tiberghien (Eds.), *The role of communication in learning to model* (pp. 303–324). Lawrence Erlbaum Associates.

Baker, M. (2003). Computer-mediated argumentative interactions for the co-elaboration of scientific notions. In J. Andriessen, M. Baker, & D. Suthers (Eds.), *Arguing to learn: Confronting cognitions in computer-supported collaborative learning environments* (pp. 47–78). Kluwer Academic.

Baker, M., Andriessen, J., & Schwarz, B. B. (2020). Collaborative argumentation-based learning. In N. Mercer, R. Wegerif, & L. Major (Eds.), *The Routledge international handbook of research on dialogic education* (pp. 76–88). Routledge.

Bova, A. (2017). The role of the teacher in promoting argumentative interactions in the learning contexts of higher education. In F. Arcidiacono, & A. Bova (Eds.), *Interpersonal argumentation in educational and professional contexts* (pp. 75–95). Springer.

Bringula, R. P., Batalla, M. Y. C., Moraga, S. D., Ochengco, L. D. R., Ohagan, K. N., & Lansigan, R. R. (2012). School choice of computing students: a comparative perspective from two universities. *Creative Education*, *3*, 1070–1078. https://dx.doi.org/10.4236/ce.2012.326161

Bryman, A. (2016). *Social research methods*. 5th ed. Oxford University Press.

Cambridge Dictionary (2021). Online version. dictionary.cambridge.org. Cambridge University Press.

Chang, Y., Hill, J., & Hannafin, M. (2021). Emerging trends to foster student-centered learning in the disciplines: Science, engineering, computing and medicine. In S. Hoidn, & M. Klemenčič (Eds.), *The Routledge international handbook of student-centered learning and teaching in higher education* (pp. 221–234). Routledge.

Clark, D. B., Sampson, V., Weinberger, A., & Erkens, G. (2007). Analytic frameworks for assessing dialogic argumentation in online learning environments. *Educational Psychology Review*, *19*(3), 343–374. https://doi.org/10.1007/s10648-007-9050-7

Clark, D. B., & Sampson, V. (2008). Assessing dialogic argumentation in online environments to relate structure, grounds, and conceptual quality. *Journal of Research in Science Teaching*, *45*(3), 293–321. https://doi.org/10.1002/tea.20216

Cohen, J. (1960). A coefficient of agreement for nominal scales. *Educational and Psychological Measurement*, *20*(1), 37–46. https://doi.org/10.1177/001316446002000104

Corbera, E., Anguelovski, I., Honey-Rosés, J., & Ruiz-Mallén, I. (2020). Academia in the time of COVID-19: Towards an ethics of care. *Planning Theory & Practice*, *21*(2), 191–199. https://doi.org/10.1080/14649357.2020.1757891

Erduran, S. (2020). Bringing nuance to "the science" in public policy and science understanding. *Science & Education*, *29*(3), 487–489. https://doi.org/10.1007/s11191-020-00137-3

Erduran, S., Guilfoyle, L., & Park, W. (2022). Science and religious education teachers' views of argumentation and its teaching. *Research in Science Education*, *52*(2), 655–673. https://doi.org/10.1007/s11165-018-9758-z

Erickson, F. (2012). Qualitative research methods for science education. In B. J. Fraser, K. G. Tobin, & C. J. McRobbie (Eds.), *Second international handbook of science education* (pp. 1451–1469). Springer.

George, D., & Mallery, P. (2020). *IBM SPSS statistics 26 step by step*. 16th ed. Routledge.

Hall, R. (2020). The hopeless university: Intellectual work at the end of the end of history. *Postdigital Science and Education*, *2*(3), 830–848. https://doi.org/10.1007/s42438-020-00158-9

Hoidn, S. (2017). *Student-centered learning environments in higher education classrooms*. Palgrave Macmillan.

Hoidn, S., & Klemenčič, M. (Eds.). (2021a). *The Routledge international handbook of student-centered learning and teaching in higher education*. Routledge.

Hoidn, S., & Klemenčič, M. (2021b). Introduction and overview. In S. Hoidn, & M. Klemenčič (Eds.), *The Routledge international handbook of student-centered learning and teaching in higher education* (pp. 1–13). Routledge.

Jacobs, G. M., Renandya, W. A., & Power, M. (2016). *Simple, powerful strategies for student centered learning*. Springer.

Jaggars, S. S. (2021). Introduction to the special issue on the COVID-19 emergency transition to remote learning. *Online Learning*, *25*(1), 1–7. http://dx.doi.org/10.24059/olj.v24i2.2299

Jariyah, I., & Tyastirin, E. (2020). Proses dan kendala pembelajaran biologi di masa pandemi Covid-19: Analisis respon mahasiswa. *Jurnal Penelitian dan Pengkajian Ilmu Pendidikan*: e-Saintika, *4*(2), 183–196. https://doi.org/10.36312/e-saintika.v4i2.224

Jiménez-Aleixandre, M. P., & Brocos, P. (2017). Processes of negotiation in socio-scientific argumentation about vegetarianism in teacher education. In F. Arcidiacono, & A. Bova (Eds.), *Interpersonal argumentation in educational and professional contexts* (pp. 117–139). Springer.

Johnson, J. E., & Barr, N. B. (2021). Moving hands-on mechanical engineering experiences online: Course redesigns and student perspectives. *Online Learning*, *25*(1), 209–219. https://doi.org/10.24059/olj.v25i1.2465

Kampourakis, K. (2017). Science teaching in university science departments. *Science & Education*, *26*(3-4), 201–203. https://doi.org/10.1007/s11191-017-9903-5

Morgan, K., Adams, E., Elsobky, T., Darr, A., & Brackbill, M. (2021). Moving assessment online: Experiences within a school of pharmacy. *Online Learning*, *25*(1), 245–252. https://doi.org/10.24059/olj.v25i1.2580

Namdar, A. O., & Namdar, B. (2021). Blending creative drama and computer-supported collaborative learning for socioscientific argumentation. In W. A. Powell (Ed.), *Socioscientific issues-based instruction for scientific literacy development* (pp. 132–160). IGI Global.

Osborne, J. (2010). Arguing to learn in science: The role of collaborative, critical discourse. *Science*, *328*(5977), 463–466. https://doi.org/10.1126/science.1183944

Oxford English Dictionary (2021). Online version. oed.com. Oxford University Press.

Pabuccu, A., & Erduran, S. (2017). Beyond rote learning in organic chemistry: The infusion and impact of argumentation in tertiary education. *International Journal of Science Education*, *39*(9), 1154–1172. https://doi.org/10.1080/09500693.2017.1319988

Plantin, C. (2018). *Dictionary of argumentation. An introduction to argumentation studies*. College Publications.

Quintana, R., & Correnti, R. (2019). The right to argue: Teaching and assessing everyday argumentation skills. *Journal of Further and Higher Education*, *43*(8), 1133–1151. https://doi.org/10.1080/0309877X.2018.1450967

Rapanta, C., Botturi, L., Goodyear, P., Guàrdia, L., & Koole, M. (2020). Online university teaching during and after the Covid-19 crisis: Refocusing teacher presence and learning activity. *Postdigital Science and Education*, *2*(3), 923–945. https://doi.org/10.1007/s42438-020-00155-y

Saldana, J. (2021). *The coding manual for qualitative researchers*. 4th ed. Sage.

Schwarz, B. B., & Baker, M. J. (2017). *Dialogue, argumentation, and education: History, theory, and practice*. Cambridge University Press.

Sun, L., Tang, Y., & Zuo, W. (2020). Coronavirus pushes education online. *Nature Materials*, *19*(6), 687. https://doi.org/10.1038/s41563-020-0678-8

Tagg, J. (2021). Foreword. In S. Hoidn, & M. Klemenčič (Eds.), *The Routledge international handbook of student-centered learning and teaching in higher education* (pp. xxiii–xxvii). Routledge.

Tan, S. C., & Chen, S. H. A. (2020). Introduction. In S. C. Tan, & S. H. A. Chen (Eds.), *Transforming teaching and learning in higher education* (pp. 1–10). Springer.

Uzuntiryaki-Kondakci, E., Tuysuz, M., Sarici, E., Soysal, C., & Kilinc, S. (2021). The role of the argumentation-based laboratory on the development of preservice chemistry teachers' argumentation skills. *International Journal of Science Education*, *43*(1), 30–55. https://doi.org/10.1080/09500693.2020.1846226

Wieman, C. (2017). *Improving how universities teach science.* Harvard University Press.

Zhu, X., & Liu, J. (2020). Education in and after Covid-19: Immediate responses and long-term visions. *Postdigital Science and Education*, *2*(3), 695–699. https://doi.org/10.1007/s42438-020-00126-3

Appendix A
Survey

1. Have you ever received instruction in argumentation?
   a. Yes
   b. No
2. Do you consider that the Food Microbiology course provided you with opportunities to interact argumentatively with your partners?
   a. Yes
   b. No
   Why?
3. In the Food Microbiology course, which type of difficulty did you come up against in interacting argumentatively with your partners? (More than one option is possible)
   a. Unstable network
   b. Little time to discuss
   c. Mastery of scientific knowledge
   d. Other …………………………..
   e. I did not encounter any difficulty
4. Were the sessions of argumentative interaction with your partners useful for you?
   a. Yes
   b. No
   Why?
5. In times of Covid-19, how often do you have the opportunity to participate in student-student online verbal argumentative interaction (OVAI) sessions in other university online courses?
   a. Very frequently.
   b. Fairly frequently.
   c. Infrequently.
   d. Never.

How well do you agree with the following statements: (1) Strongly disagree, (2) Disagree, (3) Neither agree/ disagree, (4) Agree, and (5) Strongly agree.

		1	2	3	4	5
6.	I liked the student-student OVAI sessions	□	□	□	□	□
7.	The student-student OVAI sessions helped me to develop deep learning	□	□	□	□	□
8.	The student-student OVAI sessions were an opportunity to practice my argumentation skills	□	□	□	□	□
9.	The student-student OVAI sessions helped me become aware of my learning process	□	□	□	□	□
10.	Student-student OVAI sessions should continue to be promoted in the Food Microbiology course	□	□	□	□	□
11.	Student-student OVAI sessions should be promoted in other university online courses as well	□	□	□	□	□

The Community of Inquiry Perspective on Teachers' Role and Students' Evaluations of Online Project-Based Learning

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Abstract
The role of teachers is an important element of online project-based learning courses. Based on the Community of Inquiry framework, this study examined how students' perceptions of teaching presence, through social presence and cognitive presence, were related to their evaluations of online project-based learning. A 16-week online project-based legal education course was implemented. During the course, students engaged in two small group activities and created two final products. Survey data were collected twice from 38 and 41 students in two course phases. Results from partial least squares analyses revealed that teaching presence was directly related to students' evaluations in the early stage of the course and indirectly related to students' evaluations, through the effects of social presence, in the entire course. Practical implications for teachers and suggestions for further studies are provided.

Keywords: Online project-based learning; teacher role; student evaluation; teaching presence; social presence

Clinical legal education is a prevailing teaching method in university legal education. This method is practice oriented, aiming to develop students' practical legal skills by solving real client problems. However, while understanding legal theory is very important, law educators have not reached a consensus on how to teach it. Teaching legal theory places high requirements on students' critical thinking ability, especially at the graduate level. For example, many different theories and legal provisions may be applicable to the same case, leading to different solutions. All these pose challenges to legal theory education but teaching legal theory could be supported by the pedagogy of project-based learning (PjBL). Rooted in the idea of active construction, PjBL encourages learners' investigation and construction of knowledge (Reis et al., 2018), improves deep understanding of discipline concepts (Barak & Dori, 2005; Costa-Silva et al., 2018; Torres et al., 2019), and develops diverse cognitive strategies (Heo et al., 2010; Hou et al., 2007; Stozhko et al., 2015; Wu et al., 2013). However, research on PjBL related to law education is scarce. To better understand this methodology, student evaluations of PjBL have been examined in the current study.

The application of PjBL in an online environment has grown in popularity in postsecondary education (Çakiroğlu & Erdemir, 2019; Shih & Tsai, 2017; Usher & Barak, 2018). Some researchers claim that online PjBL contributes to perceived learning and student satisfaction because high-quality interactivity and communication among learners can be achieved (Gomez-Pablos et al., 2017; Lou & Kim MacGregor, 2004). However, this is inseparable from the role of instructors, especially in the online environment (Garrison & Arbaugh, 2007). To make a successful learning experience in online PjBL where learners' social and cognitive interactions play a key role, it is suggested that both the organization (i.e., course design) and guidance (i.e., facilitation and direction) of teaching should be carefully considered (Garrison et al., 2000; Garrison & Arbaugh, 2007). Although previous studies have found a positive relationship between teaching and student perceptions of online learning in general (Arbaugh, 2008; Choo et al., 2020), in online PjBL the association between teaching, students' interaction and their evaluations is not clearly revealed yet.

In the present study, we aimed to investigate graduate law students' evaluations of online PjBL and how they are related to the role of the teacher. To achieve this goal, PjBL was implemented in an online legal education course at a Chinese university. The findings might provide teachers with guidance concerning instruction in an online PjBL environment and contribute to the development of future online PjBL curricula.

Project-Based Learning

Project-based learning (PjBL) refers to a learner-centered instructional and learning approach (Helle et al., 2006) where students acquire and apply knowledge and eventually construct new information by completing real-world projects. Most importantly, a shared artifact is developed by students based on an authentic driving question (Blumenfeld et al., 1991; Helle et al., 2006). For example, in Papastergiou (2005), student teachers created educational websites for primary schools as artifacts. To develop the final product, learners usually work in small groups (Chen & Yang, 2019; Krajcik et al., 2008) where they collaboratively define problems, exchange ideas, collect and analyze data, and present results (Blumenfeld et al., 1991; Kokotsaki et al., 2016; Lee et al., 2016). It is believed that the integration of PjBL with collaborative learning contributes to effective learning, especially among students with varying levels of prior knowledge (Al-Rawahi & Al-Mekhlafi, 2015; Lou & Kim MacGregor, 2004). Moreover, the use of educational technologies is another important feature of PjBL (Krajcik & Shin, 2014). In the studies of Chua (2014) and Chua et al. (2014), students developed small agricultural dryers in groups during an engineering project. The results of Chen and Yang's (2019) review study showed that PjBL, integrated with scaffolding information technology, has a positive influence on students' effective

learning. In Guo et al. (2021), 24 groups of college students participated in an online mental health project and, using an instant messaging app, and thereafter discussed and wrote a film analysis report as the final product. The results showed that students' engagement in the project was positively related to their academic performance.

The Role of Teachers in Online PjBL

The role of instructors is an essential element of PjBL curricula (Du et al., 2009; Gomez-Pablos et al., 2017). In online PjBL, the role of instructors is predominant in four areas: instruction, facilitation, management, and technical support (Çakiroğlu & Erdemir, 2019; Maor, 2003). Specifically, the basic task of teachers is to design the course and give lectures on the essential content knowledge that provides students with fundamental information about the course. Moreover, different from teacher-centered instruction, teachers utilizing PjBL usually act as facilitators (Bell, 2010; Tseng et al., 2013) who provide students with feedback on projects (Quintana & Quintana, 2020) and assist them to fully understand the tasks that they cannot grasp on their own (van Rooij, 2009). However, teachers normally provide such assistance only when students ask for help. PjBL can be characterized by little direct supervision and significant autonomy (Xu & Liu, 2010). For example, Stefanou et al. (2013) found that, compared to students in problem-based courses, learners who participated in PjBL perceived significantly higher instructor support for their autonomy. Based on the survey and interview results about teachers' beliefs of English as Foreign Language (EFL) learners' autonomy, Meisani and Rambet (2017) concluded that instructors should promote student autonomy in PjBL education. Regarding the managerial role, the survey results of teachers' experience of implementing PjBL with digital technologies have revealed that most instructors encouraged learners to participate in learning activities and monitored and recorded their work (Gomez-Pablos et al., 2017). Likewise, Çakiroğlu and Erdemir (2019) revealed that an important administrative role of instructors is to help students concentrate on their projects. Maor (2003) also found that teachers encouraged ongoing student discourse. To this end, improved rules, and instructions about high-quality interactions were given by teachers. As for the support for ICT, Maor (2003) revealed that although most students were good at using technologies, teachers still provided necessary guidance on specific technical issues. Similarly, Shadiev et al. (2015) reported that online instructors assisted students with how to reply to others' comments and upload documents. For new and unfamiliar technology, teachers provided learners with in-time support and solutions (Çakiroğlu & Erdemir, 2019).

Students' Evaluations of Online PjBL

Several studies have reported students' evaluations of learning experience and the effectiveness of online PjBL. In general, learners perceived that online PjBL is an interesting and helpful learning method that advanced their learning outcomes, such as content knowledge, collaboration skills, and learning motivation (Balash et al., 2019; Shih & Tsai, 2017; Zhang et al., 2009). For example, Al-Rawahi and Al-Mekhlafi (2015) reported that English learners' writing skills significantly improved after they participated in online PjBL with group members compared to students who worked alone and offline. Moreover, learners believed that online collaborative PjBL was a good way to develop communication and interaction with others. Tsai et al. (2019) revealed several advantages of PjBL integrated with video lectures for student learning of building information modeling. Students perceived that being involved in the process of PjBL gave them the opportunity to be close to a real project and allowed them to gradually learn the modeling. Their modeling skills also improved and they had a deeper understanding of the concept of civil engineering. Besides, tutorial videos were helpful for students' understanding of the complex part of modeling as they could watch the video repeatedly. Also, students were more patient and motivated in the learning process.

By the analysis of semi-structured student interviews, Shadiev et al. (2015) found that learners actively exchanged information and collaborated with each other in synchronous and asynchronous PjBL, which promoted cross-cultural understanding. Moreover, most teachers and students expected to participate in online collaborative PjBL in the future. When it comes to the specific leadership method in online collaborative PjBL, Yilmaz et al., (2020) found that both shared and vertical group leadership approaches contributed to students' learning motivation, skills of self-regulated learning, and collaboration with group members. Specifically, shared leadership was more useful to promote group trust while vertical leadership was helpful to improve group interaction.

Despite these benefits, PjBL is not without criticism. Zhang et al. (2009) reported student perceptions of their first experience of online collaborative PjBL. Interviews with students revealed that while students were satisfied with online PjBL overall, they still expressed frustration over the lack of physical connection with teachers and peers. Some students felt that PjBL was complicated and time consuming and preferred to receive direct instruction from teachers rather than to explore the task by themselves. In the study of Al-Rawahi and Al-Mekhlafi (2015), online collaborative PjBL implemented in an EFL course was not significantly related to students' attitude towards English learning. The reason might be that many learners thought online PjBL was not useful and wasted time, especially when they perceived difficulties in getting responses from online group members.

Community of Inquiry Framework

One of the most frequently adopted theoretical frameworks for understanding online collaborative learning in higher education is the Community of Inquiry (CoI) framework (Garrison et al., 2000; Garrison & Arbaugh, 2007). This framework consists of three key elements (social presence, cognitive presence, and teaching presence) that interact with each other to advance student learning. Social presence indicates students' ability to see themselves as "real people" in a virtual environment and to interact with others socially and affectively (Garrison et al., 2000). Cognitive presence is defined as the extent to which "learners are able to construct and confirm meaning through sustained reflection and discourse in a critical community of inquiry" (Garrison et al., 2001, p. 11). As for teaching presence, Garrison et al. (2000) pointed out that teachers have two main roles in online teaching, as designers of educational activities and facilitators of student learning. Anderson et al. (2001) added an additional role of the online instructor, as the expert who provides students with direct instruction. Thus, three components of teaching presence were proposed by Anderson et al. (2001), namely instructional design and organization, discourse facilitation, and direct instruction.

The three components of CoI framework intercorrelate with each other (Arbaugh, 2008; Armellini & De Stefani, 2016; Garrison & Anderson, 2003). However, teaching presence usually plays a central role in an online community of inquiry (Garrison et al., 2010) and influences social presence and cognitive presence (Cleveland-Innes et al., 2019; Garrison et al., 2000). From the theory, Garrison et al., (2000) claimed that teaching presence appears before students' interactions occur (e.g., instructional design and organization) and provides specific direction and defined parameters to students' social and cognitive interactions. Many studies have found that teaching presence is positively related to social presence and cognitive presence (Akyol & Garrison, 2008; Archibald, 2010; Garrison et al., 2010; Shea et al., 2010). For example, large-scale studies, such as Shea and Bidjerano (2009), with more than 2000 online students and Joo et al. (2011), with around 800 online learners, have found that teaching presence predicted both social and cognitive presences. In another study, Ke (2010) investigated the relationship between the three presences in online courses for adult learners. Both quantitative and qualitative results showed that students' social and cognitive presences

were significantly influenced by the design, facilitation, and teaching features of the course. These results indicated that social and cognitive presences emerge in an online environment where effective teaching presence appears.

The classical review study of Garrison and Arbaugh (2007) pointed out that a large body of previous studies reported positive relationships between student learning outcomes and social, cognitive, and teaching presences. Recent studies have reported similar results (Abdous & Yen, 2010; Akyol & Garrison, 2008; Arbaugh, 2008; Baker, 2010; Choo et al., 2020). For example, Boston et al. (2009) investigated whether the three presences influenced learners' willingness to re-enroll an online course. The analysis of more than 28000 students' survey data revealed that social presence significantly accounted for students' rate of re-enrollment. Sidiropoulou and Mavroidis (2019) found that graduate students' learning style, such as understanding of information, was positively related to cognitive presence. Shea et al. (2005) investigated the significance of teaching presence in online asynchronous courses. The analysis of survey data of more than 2000 students from 32 colleges revealed that students' perceptions of teaching presence, including instructional design and directed facilitation, were positively related to students' sense of learning community. In addition, Joo et al. (2011) examined how computer learners' perceptions of presences influenced their satisfaction with online learning experience and intention to complete the course. Results from structural equation modeling analyses found that teaching presence had direct positive effects on student satisfaction and indirect positive effects on it through the mediating effect of cognitive presence. However, none of the three presences had effects on students' continuation intention and motivation for the course.

Research Questions

The present study aimed to provide more insights into graduate law students' evaluations of online PjBL and how they are related to the role of teachers based on the CoI framework. Thus, the specific research questions and a hypothesized research model examined (Figure 1) are as follows.

1. What is the relationship between students' perceptions of teaching presence and their evaluations of online PjBL in the first phase of the course?
2. What is the relationship between students' perceptions of teaching presence and their evaluations of online PjBL in the whole phase of the course?
3. Are these relationships mediated by students' perceptions of social presence and cognitive presence during the course?

Figure 1
Hypothesized Research Model
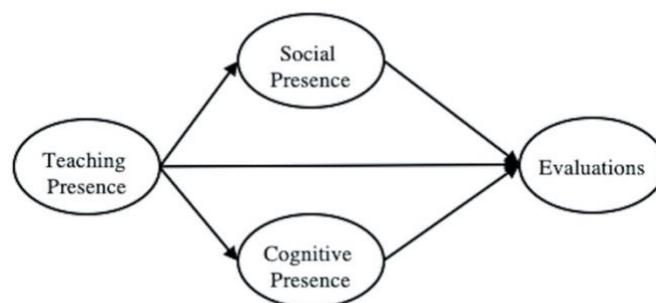
Method

Research Context and Sample

This study was based on a 16-week online course of property law for first-year master's law students in a Chinese university. During the course, as shown in Table 1, the teacher gave online lectures and students participated in two group activities and developed two artifacts (i.e., a case analysis report and a course paper) in small groups. These two final products focused on providing solutions to both practical and theoretical legal problems from the real world. Students mainly studied the chapter assigned by themselves and applied the content knowledge they learned to the report. After presenting the report in class, they further worked on it with teacher feedback and created the course paper based on the report. Thus, they achieved the most important result of PjBL: new knowledge construction. In summary, the course activities represented a project-based approach as they were authentic and reflected the "loop" of PjBL: learning and applying existing knowledge, and then constructing new knowledge via the development of final products.

Table 1

Overview of the Course Setup

Schedules	Main course activities	
	Course teacher	**Students**
Before week 1	Coordinated students in grouping	Divided themselves into groups of three
Weeks 1 to 4	Gave lectures on chapter 1 to 6	Attended lectures
	Assigned one chapter from chapter 7 to each group	Group activity 1: collaboratively wrote a case analysis report based on the chapter assigned
Weeks 5 to 10	Continued to give lectures	Attended lectures
	Gave feedback on each groups' presentation	Presented the report in class
Weeks 11 to 15	Continued to give lectures	Attended lectures
		Group activity 2: Collaboratively wrote a course paper based on the report
Weeks 16	Gave feedback on each groups' course paper	Asked questions etc.

Four types of ICT tools were adopted to scaffold the course, of which WeChat was the main tool for the completion of projects and the development of final products (see Table 2).

Table 2

Overview of the Tools Adopted in the Course

Tools		Main purposes (for course teacher and students)
A video conferencing software		To give lectures and presentations
A mobile app		To access course materials
		To complete weekly quizzes
		To submit group assignments
WeChat	The public WeChat group for the course	To inform course schedules, share extra materials, and ask and answer questions etc.
	The private WeChat group for each student group	To discuss the development of final artifacts
	Personal WeChat account	To ask and answer questions in private
E-mail		To ask and answer questions in private

Forty-two students (Mage = 23.48) attended the course, including six males. Twelve of them majored in law and the rest were non-law majors at the undergraduate level. Surveys were conducted after the group activity of case analysis report (i.e., phase 1) and after the group activity a paper was written (i.e., the whole phase). In each phase, 38 and 41 students answered the survey, respectively.

Measures

Although some researchers have claimed that teaching presence consists of three components (e.g., Anderson et al., 2001), findings from Shea et al. (2005) revealed that the components of facilitating discourse and direct instruction could be incorporated into one component (i.e., directed facilitation). As noted, the role of the teacher in this online PjBL course was not focused on instruction but facilitation. Therefore, two factors of teaching presence, instructional design and organization (IDO) and directed facilitation (DF), were measured by 4 items and 7 items based on the work of Arbaugh et al. (2008) and Shea et al. (2005). The items "The instructor was helpful in identifying areas of agreement and disagreement on course topics that helped me to learn" and "Instructor actions reinforced the development of a sense of community among course participants" were excluded because some students reported that they did not understand these two items. A sample item of IDO and DF was "The instructor clearly communicated important course topics" and "The instructor provided feedback in a timely fashion" respectively.

Social presence (SP) and cognitive presence (CP) were measured by 9 items and 12 items, respectively, based on the work of Arbaugh et al. (2008). A sample item of SP and CP was "Online discussions help me to develop a sense of collaboration" and "Problems posed increased my interest in course issues."

Two variables of students' evaluations of PjBL, namely perceived benefits and satisfaction, were measured by 5 and 6 items based on the work of Parmelee et al. (2009) and So and Brush (2008). A sample item of perceived benefits and satisfaction was "This group activity assisted me in learning new knowledge and skills" and "In general, I am satisfied with this group activity" respectively.

All measures adopted a 6-point Likert-type rating scale from 1 = very much disagree to 6 = very much agree. The reliability and validity of each variable were examined in each measurement model in the Results section (see Table 3 and Table 4). An overview of the variables and the corresponding items can be found in the Appendix.

Analyses

To answer the three research questions, partial least squares (PLS) analyses with SmartPLS 3.0 were performed to examine model 1 for phase 1 and model 2 for the whole phase with students' perceived benefits and satisfaction as the dependent variable, students' perceptions of social presence and cognitive presence as the mediating variables, and students' perceptions of teaching presence (IDO and DF) as the independent variables.

The data analyses were conducted in two steps. First, the measurement model was estimated to determine the reliability and validity of each variable. Second, each structural model was examined to test the potential relationship between each variable.

Results

Measurement Model

To evaluate the reliability and validity of the measurement model using PLS, several indicators should be reported (Hair et al., 2011; Urbach & Ahlemann, 2010). Regarding reliability, indicator loadings of each item should be higher than 0.70, Cronbach's alpha (CA) of each variable should not be lower than 0.60, and the composite reliability (CR) should be

greater than 0.70. As for validity, the average variance extracted (AVE) should be greater than 0.50 to meet the standard of convergent validity. To test the discriminant validity, the square root of each variable's AVE should be greater than the correlation of the variable to other variables.

The results of model 1 for phase 1 and model 2 for the whole phase are presented. Results show adequate CA, CR, and AVE of model 1 (see Table 3). In model 2, items 1 and 4 of cognitive presence and item 3 of perceived benefits were left out due to the low factor loading. After removing these items, results show adequate CA, CR, and AVE of model 2 (see Table 4). Hence, the reliability and validity of the measurement model in phase 1 and the whole phase are supported.

Table 3
Means, Standard Deviations, Reliabilities and Correlation of Variables (Model 1, N = 38)

Variables	Number of items	Mean	SD	CA	CR	Correlation of Variables and AVE					
						1	2	3	4	5	6
IDO	4	5.651	.445	.874	.913	.851					
DF	7	5.478	.556	.935	.948	.836	.849				
SP	9	4.883	.896	.952	.960	.411	.494	.852			
CP	12	5.237	.697	.957	.963	.698	.814	.592	.827		
Benefits	5	5.000	.877	.954	.965	.273	.127	.568	.320	.919	
Satisfaction	6	4.899	.861	.926	.943	.356	.292	.622	.470	.836	.858

Note: Diagonal elements in the correlation of variables matrix are the square root of the AVE.

Table 4
Means, Standard Deviations, Reliabilities and Correlation of Variables (Model 2, N = 41)

Variables	Number of items	Mean	SD	CA	CR	Correlation of Variables and AVE					
						1	2	3	4	5	6
IDO	4	5.640	.481	.854	.901	.833					
DF	7	5.348	.613	.920	.934	.759	.819				
SP	9	5.100	.731	.939	.949	.377	.486	.820			
CP	10	5.163	.621	.945	.953	.643	.714	.773	.817		
Benefits	4	5.281	.744	.888	.924	.188	.395	.711	.560	.869	
Satisfaction	6	5.289	.693	.947	.958	.244	.431	.767	.546	.749	.890

Note: Diagonal elements in the correlation of variables matrix are the square root of the AVE.

Structural Model
The structural models for model 1 and model 2 were estimated with bootstrapping with 5000 subsamples. Figure 2 depicts the R^2 values and the path coefficients for both models. As shown, the R^2 for benefits were 0.47 for model 1 and 0.54 for model 2, suggesting the model explained 47.0% and 54.0% of the variance of students' perceived benefits of PjBL in two phases. The R^2 for satisfaction were 0.47 for model 1 and 0.62 for model 2, showing that the model explained 47.0% and 62.0% of the variance of students' satisfaction with PjBL in two phases. Table 5 presents the results of the path coefficients for model 1 and model 2.

Figure 2

Structural Model with Significant Relationships
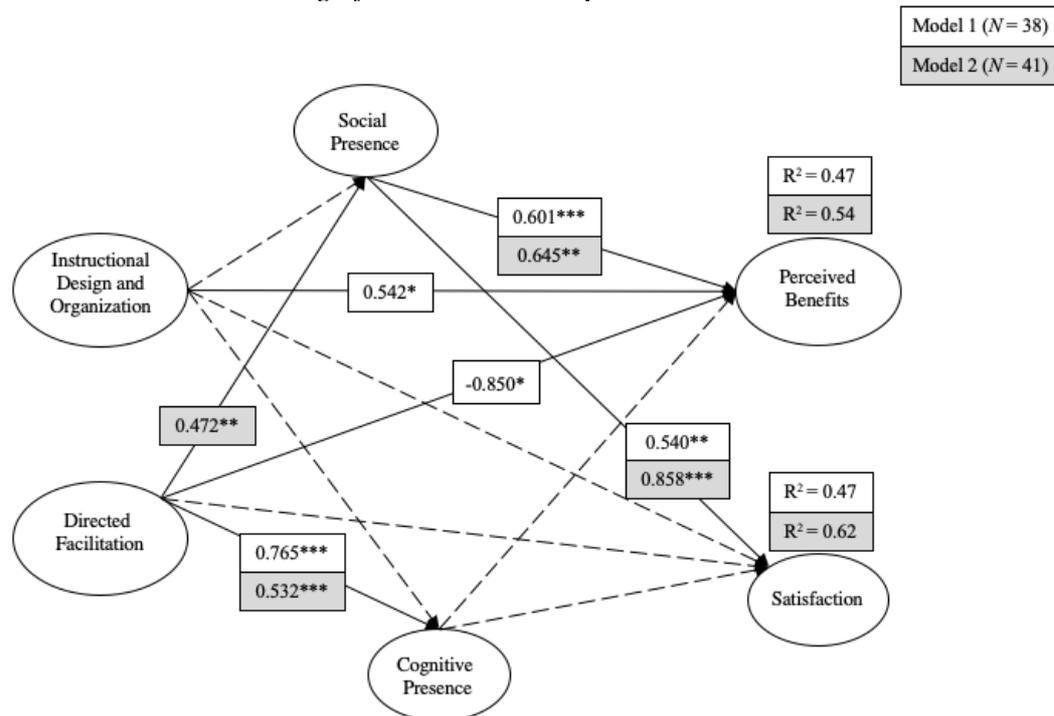
Regarding the direct effects, on the one hand, DF positively influenced CP (Path 4: β = 0.765, p < 0.001 for model 1; β = 0.532, p < 0.001 for model 2) in both models. SP positively impacted on perceived benefits (Path 9: β = 0.601, p < 0.001 for model 1; β = 0.645, p < 0.01 for model 2) and satisfaction (Path 10: β = 0.540, p < 0.01 for model 1; β = 0.858, p < 0.001 for model 2). The paths from IDO to SP, CP, and satisfaction (Path 1, 2, and 8), the paths from CP to perceived benefits and satisfaction (Path 11 and 12), and the path from DF to satisfaction (Path 8) are found to be statistically insignificant. On the other hand, some paths were only significant for one model. DF was found to positively influence SP only in model 2 (Path 3: β = 0.472, p < 0.01). The path from IDO to perceived benefits was found to be positively significant for model 1 (Path 5: β = 0.542, p < 0.05). Surprisingly, DF was found to negatively influence perceived benefits in model 1 (Path 7: β = -0.850, p < 0.05).

Regarding the indirect effects, SP mediated the relationship between DF and perceived benefits (Path 17: β = .305, p < 0.05) and satisfaction (Path 18: β = .405, p < 0.05) in model 2 rather than in model 1 (Path 17 and 18). For IDO and perceived benefits, no mediation influence was observed by SP and CP in model 1 and model 2 (Path 13 and 15). For IDO and satisfaction, no mediation influence was observed by SP and CP in both models (Path 14 and 16). In addition, CP had no mediation influence on DF and perceived benefits (Path 19) and DF and satisfaction (Path 20).

Table 5

Results of Path Coefficients for Model 1 and Model 2 (direct and indirect)

Path	Relationship	B	
		Model 1 (N = 38)	**Model 2 (N = 41)**
Direct effects			
	IDO→SP	-.008 (.026)	.019 (.119)
	IDO→CP	.059 (0.259)	.239 (1.803)
	DF→SP	.501 (1.636)	.472** (2.979)
	DF→CP	.765*** (4.120)	.532*** (3.949)
	IDO→Perceived benefits	.542* (2.012)	-.289 (1.542)
	IDO→Satisfaction	.355 (1.214)	-.157 (.800)
	DF→Perceived benefits	-.850* (2.514)	.253 (0.992)
	DF→Satisfaction	-.571 (1.589)	.293 (1.301)
	SP→Perceived benefits	.601*** (3.556)	.645** (3.281)
	SP→Satisfaction	.540** (2.701)	.858*** (5.055)
	CP→Perceived benefits	.278 (1.320)	.067 (.241)
	CP→Satisfaction	.367 (1.657)	-.226 (.913)
Indirect effects			
	IDO→SP→Perceived benefits	-.005 (.027)	.012 (.116)
	IDO→SP→Satisfaction	-.004 (.026)	.016 (.120)
	IDO→CP→Perceived benefits	.016 (.178)	.016 (.232)
	IDO→CP→Satisfaction	.022 (.217)	-.054 (.793)
	DF→SP→Perceived benefits	.301 (1.504)	.305* (2.205)
	DF→SP→Satisfaction	.270 (1.263)	.405* (2.456)
	DF→CP→Perceived benefits	.213 (1.175)	.036 (.212)
	DF→CP→Satisfaction	.281 (1.511)	-.120 (.807)

Note: ∗ p < .05, ∗∗ p < .01, ∗∗∗ p < .001. T statistics are in parenthesis.

Discussion

The aim of the current study was to investigate the potential relationship between graduate law students' evaluations of online project-based learning and teachers' role in an online course. For this purpose, a hypothesized research model was built based on the three components of Community of Inquiry framework (teaching, social, and cognitive presences) and examined through partial least squares analyses in the first and the whole phase of the course.

The Direct Role of Teaching Presence

Regarding the first two research questions, instructional design and organization played a different role in students' perceived benefits of PjBL in different phases of the course. In the first four weeks, it showed a positive influence on students' perceived benefits of the case analysis activity. This result is in line with Shea et al. (2005) who found that effective instructional design and organization matters regarding students' perceived benefits of learning with others. This means the more and clear course-related parameters that learners perceived, such as the course timeline and the design and administration of course activities (Anderson et al., 2001), the more they felt that working on a case analysis report with group members was helpful to their knowledge learning. In the first day of the class, all students received a document that explained how and when to complete group activities, and specific assessment criteria for their final products. These detailed instructions provided students' knowledge construction with appropriate guidance and "a specific direction" (Garrison & Arbaugh, 2007, p. 163) that makes learning effective. This result demonstrated the importance

of good design and organization of the course in the early stage of a learning process (Lee et al., 2016).

However, from the perspective of the entire course, the course setting had no impact on students' perceived benefits of the course paper activity. This might be related to the nature of instructional design and organization, namely, to assist learners to get familiar with important course settings in the early stage of the course and sometimes even before the course starts (Anderson et al., 2001; Ke, 2010) to help them to be quickly involved in learning. Thus, after students were familiar with the parameters of the course and course activities, which usually happened in the later stages of a course, they no longer perceived benefits from that.

Second, directed facilitation also had different effects on students' perceived benefits of PjBL in the two course phases. Surprisingly, it was found that students were more likely to report a lower sense of benefits of writing the case analysis report with peers when they reported stronger feelings of teacher's guidance and feedback. This may be due to the mismatch between the content and direction of the teacher's facilitation and students' efforts to complete the report. In the first four weeks, the instructor mainly gave lectures on the introduction of property law (corresponding to the first 6 chapters in the textbook), whereas students worked on the report based on chapter 7. Therefore, some irrelevant information explained by the teacher might be seen as unhelpful or even obstructive to the completion of the report. This might further lead to the problem reported by Zhang et al. (2009) that students would not listen to what the instructor teaches but do their own things.

Considering the whole course, however, teachers' guidance and feedback had no effects on students' perceived benefits of writing the course paper. Two reasons may explain this. First, the teacher followed the idea of PjBL and acted as a facilitator rather than a direct answer-provider for students' group activity. Thus, she did not join in private student discussion groups but mainly answered questions and provided help in the public discussion group. The lack of interactions with the instructor might induce students' insecurity and uncertainty as reported by Zhang et al. (2009) as Chinese students are used to communicating with others through social context cues (Tu, 2001). Second, the teacher observed that only a few groups proactively asked questions to her in private while most students did not look for help for the group activity. This infrequent engagement in help-seeking among novice PjBL students was also found by Harburg et al. (2018).

Furthermore, neither of the two factors of teaching presence were directly related to students' satisfaction with online PjBL. These results differ from previous studies that investigated the relationship between teaching presence and student satisfaction (e.g., Akyol & Garrison, 2008; Choo et al., 2020; Ke, 2010). For example, Arbaugh (2008) reported that teaching presence was positively associated with student delivery medium satisfaction in online MBA courses. This result may be related to the findings of Zhang et al. (2009) that students felt uncomfortable and concerned without a real teacher being around to supervise them in online PjBL.

The Indirect Role of Teaching Presence
As for the third research question, results showed that social presence was positively related to students' perceived benefits and satisfaction in both phases of the course, consistent with the results of previous studies (Arbaugh, 2008; Benbunan-Fich & Arbaugh, 2006; Richardson & Swan, 2003; Williams et al., 2006). For example, Ching and Hsu (2013) reported that learners' participation in peer feedback was positively related to their PjBL experience. The interview results of Zhang et al. (2009) revealed that students believed that collaborative learning among peers for meaningful aims allowed them to learn more and better in online PjBL. The results might be explained by the findings of Dooley and Wickersham (2007) who claimed that, in small online learning groups, students can engage in high-quality discourse

and express their own opinions. Furthermore, the results also supported by the claim of Picciano (2002) that social presence is more important when educational activities focus on collaborative knowledge construction (in this study, PjBL) rather than information acquisition.

Furthermore, the indirect effects of directed facilitation on student learning via social presence indicates that the most important role of teachers in online PjBL does not rely on facilitation but the promotion of student communication and interaction that advances student effective learning. This is consistent with the findings of Morales et al. (2013) who noted that effective learning can be achieved through peer mentoring and collaboration with minimal teacher instruction in a virtual learning environment. This is also confirmed by students' interview in Zhang et al. (2009) that it is better to let students work on the projects themselves and ask for teachers' help only if they encounter problems. Moreover, this result supported the claim of Anderson et al. (2001) and Garrison and Akyol (2013) that it is the teaching presence rather than the teacher presence that is of importance, which can be extended to students and achieved by their collaboration.

Implications for Practice

The findings of this study offer two implications for instructors on the design and implementation of online PjBL courses. The first important implication is that teachers should pay attention to the design and organization of curriculum-related parameters, particularly in the early stage of the course. Table 6 presents several indispensable elements that we think are crucial when developing and implementing an online PjBL course. We believe that a clear and detailed description of these elements can help students quickly start the project, reduce their sense of confusion and anxiety, and improve their perceptions of learning effectiveness. Moreover, the findings of the present study also implied that the most important role of teachers in online PjBL is not as direct instructors but learning facilitators who encourage students to interact with peers. Possible strategies for teachers to do so are, for example, to score the frequency and quality of students' group interaction and regularly raise questions for learners to think and discuss (Gašević et al., 2015). In short, teachers should enthusiastically promote student interactions with group members to advance effective student learning.

Table 6
Overview of Important Elements for the Setup of Online Project-Based Learning Courses

Elements to be considered	Main Aspects to be Elaborated
Pedagogy (i.e., project-based learning)	Definition
	Hallmarks (e.g., artifacts; collaboration)
	Significance/effects
Projects and artifacts	Significance of projects
	Artifact type1 (i.e., physical objects; documents; multimedia)
	Assessment criteria for artifacts
	Examples
Other educational activities	Schedules
	Procedures
	Assessment criteria
Course materials	In-class resources (e.g., textbooks; handout)
	Extracurricular resources (e.g., extra reading materials)
Schedules	Course duration
	Weekly tasks
ICT tools	What tools and how to use
	Purpose of each tool

Note: 1. Based on Guo et al. (2020).

Limitations and Future Directions

To address the limitations of this study, the following strategies could improve future research. First, the presence variables could be measured in-depth. For instance, the measurement of social and cognitive presences could be conducted based on the sub-categories of the presences as in previous studies (Shea et al., 2010). In doing so, a clearer relationship between students' online learning experience and perceived learning could be depicted. Second, since more and more educational studies are implemented online, it is recommended to collect recorded data of student learning too (Galikyan & Admiraal, 2019) to get a more detailed image of student online learning (Deane et al., 1998). Third, a mixed-method approach of explanatory sequential design (Creswell, 2012; Leavy, 2017) could be adopted. This means that quantitative data are collected and analyzed first, followed by the collection and analysis of qualitative data to gain a deeper interpretation of the results. For example, quantitative information like the performance of students' final artifacts could be collected in future studies to reveal their actual academic achievement in online PjBL. Based on the results of artifact grading, interviews with students and teachers could be conducted to assess why students succeeded or failed in some way in developing the final products and how they see the positive and challenging aspects of online PjBL. Last, the small sample of master law students limits its generalizability to other educational contexts. To increase the generalizability, it would be helpful to conduct future research with large samples from different disciplines (e.g., MOOCs) to fully understand online PjBL.

Concluding Remarks

Based on the results of this study, it can be concluded that teaching presence can have both direct and indirect effects on students' evaluations of online project-based learning. Specifically, both instructional design and organization and direct facilitation were directly related to students' perceived benefits in the early stage of the course, in a positive and negative way, respectively. Furthermore, based on the entire course, instructors' direct facilitation could positively influence students' interactions with group members, thereby indirectly affecting students' perceptions of effective learning and satisfaction with online project-based learning. These findings can serve as guidelines on how to better develop online project-based learning courses and help teachers to adjust their role in the learning process so as to better assist students to benefit from online project-based learning.

References

Abdous, M., & Yen, C.-J. (2010). A predictive study of learner satisfaction and outcomes in face-to-face, satellite broadcast, and live video-streaming learning environments. *The Internet and Higher Education*, *13*(4), 248–257. https://doi.org/10.1016/j.iheduc.2010.04.005

Akyol, Z., & Garrison, D. R. (2008). The development of a community of inquiry over time in an online course: Understanding the progression and integration of social, cognitive and teaching presence. *Journal of Asynchronous Learning Networks*, *12*(3–4), 3–22.

Al-Rawahi, L. S., & Al-Mekhlafi, A. M. (2015). The effect of online collaborative project – based learning on English as a Foreign Language learners' language performance and attitudes. *Learning and Teaching in Higher Education: Gulf Perspectives*, *12*(2). http://lthe.zu.ac.ae

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

Arbaugh, J. B. (2008). Does the Community of Inquiry Framework Predict Outcomes in Online MBA Courses? *International Review of Research in Open and Distance Learning*, *9*(2). https://doi.org/10.19173/irrodl.v9i2.490

Arbaugh, J. B., Cleveland-Innes, M., Diaz, S. R., Garrison, D. R., Ice, P., Richardson, J. C., & Swan, K. P. (2008). Developing a community of inquiry instrument: Testing a measure of the Community of Inquiry framework using a multi-institutional sample. *The Internet and Higher Education*, *11*(3–4), 133–136. https://doi.org/10.1016/j.iheduc.2008.06.003

Archibald, D. (2010). Fostering the development of cognitive presence: Initial findings using the community of inquiry survey instrument. *The Internet and Higher Education*, *13*(1–2), 73–74. https://doi.org/10.1016/j.iheduc.2009.10.001

Armellini, A., & De Stefani, M. (2016). Social presence in the 21st century: An adjustment to the Community of Inquiry framework. *British Journal of Educational Technology*, *47*(6), 1202–1216. https://doi.org/10.1111/bjet.12302

Baker, C. (2010). The impact of instructor immediacy and presence for online student affective learning, cognition, and motivation. *The Journal of Educators Online*, *7*(1). https://doi.org/10.9743/JEO.2010.1.2

Balash, C., Richardson, S., Guzzomi, F., & Rassau, A. (2019). Engineering Mechanics: Adoption of project-based learning supported by computer-aided online adaptive assessments overcoming fundamental issues with a fundamental subject. *European Journal of Engineering Education*. https://doi.org/10.1080/03043797.2019.1664413

Barak, M., & Dori, Y. J. (2005). Enhancing undergraduate students' chemistry understanding through project-based learning in an it environment. *Science Education*, *89*(1), 117–139. https://doi.org/10.1002/sce.20027

Bell, S. (2010). Project-based learning for the 21st century: Skills for the future. *The Clearing House*, *83*(2), 39–43. https://doi.org/10.1080/00098650903505415

Benbunan-Fich, R., & Arbaugh, J. B. (2006). Separating the effects of knowledge construction and group collaboration in learning outcomes of web-based courses. *Information & Management*, *43*(6), 778–793. https://doi.org/10.1016/j.im.2005.09.001

Blumenfeld, P. C., Soloway, E., Marx, R. W., Krajcik, J. S., Guzdial, M., & Palincsar, A. (1991). Motivating project-based learning: Sustaining the doing, supporting the learning. *Educational Psychologist*, *26*(3 & 4), 369–398. https://doi.org/10.1207/s15326985ep2603&4_8

Boston, W., Díaz, S. R., Gibson, A. M., Ice, P., Richardson, J., & Swan, K. (2009). An exploration of the relationship between indicators of the Community of Inquiry framework and retention in online programs. *Journal of Asynchronous Learning Networks*, *13*(3), 67–83.

Çakiroğlu, Ü., & Erdemir, T. (2019). Online project based learning via cloud computing: Exploring roles of instructor and students. *Interactive Learning Environments*, *27*(4), 547–566. https://doi.org/10.1080/10494820.2018.1489855

Chen, C.-H., & Yang, Y.-C. (2019). Revisiting the effects of project-based learning on students' academic achievement: A meta-analysis investigating moderators. *Educational Research Review*, *26*, 71–81. https://doi.org/10.1016/j.edurev.2018.11.001

Ching, Y.-H., & Hsu, Y.-C. (2013). Peer feedback to facilitate project-based learning in an online environment. *The International Review of Research in Open and Distributed Learning*, *14*(5), 258–276. https://doi.org/10.19173/irrodl.v14i5.1524

Choo, J., Bakir, N., Scagnoli, N. I., Ju, B., & Tong, X. (2020). Using the Community of Inquiry framework to understand students' learning experience in online undergraduate business courses. *TechTrends*, *64*, 172–181.

Chua, K. J. (2014). A comparative study on first-time and experienced project-based learning students in an engineering design module. *European Journal of Engineering Education*, *39*(5), 556–572. https://doi.org/10.1080/03043797.2014.895704

Chua, K. J., Yang, W. M., & Leo, H. L. (2014). Enhanced and conventional project-based learning in an engineering design module. *International Journal of Technology and Design Education*, *24*(4), 437–458. https://doi.org/10.1007/s10798-013-9255-7

Cleveland-Innes, M., Garrison, D. R., & Vaughan, N. (2019). The Community of Inquiry theoretical framework: Implications for distance education and beyond. In *Handbook of Distance Education* (Fourth edition, pp. 67–78). Routledge.

Costa-Silva, D., Côrtes, J. A., Bachinski, R. F., Spiegel, C. N., & Alves, G. G. (2018). Teaching cell biology to dental students with a project-based learning approach. *Journal of Dental Education*, *82*(3), 322–331. https://doi.org/10.21815/JDE.018.032

Creswell, J. W. (2012). *Educational research: Planning, conducting, and evaluating quantitative and qualitative research* (4th ed). Pearson.

Deane, F. P., Podd, J., & Henderson, R. D. (1998). Relationship between self-report and log data estimates of information system usage. *Computers in Human Behavior*, *14*(4), 621–636. https://doi.org/10.1016/S0747-5632(98)00027-2

Dooley, K. E., & Wickersham, L. E. (2007). Distraction, domination, and disconnection in whole-class, online discussions. *The Quarterly Review of Distance Education*, *8*(1), 1–8.

Du, X., de Graaff, E., & Kolmos, A. (Eds.). (2009). Diversity of PBL– PBL learning principles and models. In *Research on PBL Practice in Engineering Education* (pp. 9–21). Sense Publishers.

Galikyan, I., & Admiraal, W. (2019). Students' engagement in asynchronous online discussion: The relationship between cognitive presence, learner prominence, and academic performance. *The Internet and Higher Education*, *43*, 100692. https://doi.org/10.1016/j.iheduc.2019.100692

Garrison, D. R., & Akyol, Z. (2013). Toward the development of a metacognition construct for communities of inquiry. *The Internet and Higher Education*, *17*, 84–89. https://doi.org/10.1016/j.iheduc.2012.11.005

Garrison, D. R., & Anderson, T. (2003). *E-learning in the 21st century: A framework for research and practice*. Taylor & Francis e-Library.

Garrison, D. R., Anderson, T., & Archer, W. (2000). Critical inquiry in a text-based environment: Computer conferencing in higher education. *The Internet and Higher Education*, *2*(2–3), 87–105. https://doi.org/10.1016/S1096-7516(00)00016-6

Garrison, D. R., Anderson, T., & Archer, W. (2001). Critical thinking, cognitive presence, and computer conferencing in distance education. *American Journal of Distance Education*, *15*(1), 7–23. https://doi.org/10.1080/08923640109527071

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

Garrison, D. R., Cleveland-Innes, M., & Fung, T. S. (2010). Exploring causal relationships among teaching, cognitive and social presence: Student perceptions of the community of inquiry framework. *The Internet and Higher Education*, *13*(1–2), 31–36. https://doi.org/10.1016/j.iheduc.2009.10.002

Gašević, D., Adesope, O., Joksimović, S., & Kovanović, V. (2015). Externally-facilitated regulation scaffolding and role assignment to develop cognitive presence in asynchronous online discussions. *The Internet and Higher Education*, *24*, 53–65. https://doi.org/10.1016/j.iheduc.2014.09.006

Gomez-Pablos, V. B., del Pozo, M. M., & Munoz-Repiso, A. G.-V. (2017). Project-based learning (PBL) through the incorporation of digital technologies: An evaluation based on the experience of serving teachers. *Computers in Human Behavior*, *68*, 501–512. https://doi.org/10.1016/j.chb.2016.11.056

Guo, P., Saab, N., Post, L. S., & Admiraal, W. (2020). A review of project-based learning in higher education: Student outcomes and measures. *International Journal of Educational Research*, *102*, 101586. https://doi.org/10.1016/j.ijer.2020.101586

Guo, P., Saab, N., Wu, L., & Admiraal, W. (2021). The Community of Inquiry perspective on students' social presence, cognitive presence, and academic performance in online project-based learning. *Journal of Computer Assisted Learning*, *1–15*. https://doi.org/10.1111/jcal.12586

Hair, J. F., Ringle, C. M., & Sarstedt, M. (2011). PLS-SEM: Indeed a silver bullet. *Journal of Marketing Theory and Practice*, *19*(2), 139–152. https://doi.org/10.2753/MTP1069-6679190202

Harburg, E., Lewis, D. R., Easterday, M., & Gerber, E. M. (2018). CheerOn: Facilitating online social support for novice project-based learning teams. *ACM Transactions on Computer-Human Interaction*, *25*(6), Article 32. https://doi.org/10.1145/3241043

Helle, L., Tynjälä, P., & Olkinuora, E. (2006). Project-based learning in post-secondary education—theory, practice and rubber sling shots. *Higher Education*, *51*(2), 287–314. https://doi.org/10.1007/s10734-004-6386-5

Heo, H., Lim, K. Y., & Kim, Y. (2010). Exploratory study on the patterns of online interaction and knowledge co-construction in project-based learning. *Computers & Education*, *55*(3), 1383–1392. https://doi.org/10.1016/j.compedu.2010.06.012

Hou, H.-T., Chang, K.-E., & Sung, Y.-T. (2007). An analysis of peer assessment online discussions within a course that uses project-based learning. *Interactive Learning Environments*, *15*(3), 237–251. https://doi.org/10.1080/10494820701206974

Joo, Y. J., Lim, K. Y., & Kim, E. K. (2011). Online university students' satisfaction and persistence: Examining perceived level of presence, usefulness and ease of use as predictors in a structural model. *Computers & Education*, *57*(2), 1654–1664. https://doi.org/10.1016/j.compedu.2011.02.008

Ke, F. (2010). Examining online teaching, cognitive, and social presence for adult students. *Computers & Education*, *55*(2), 808–820. https://doi.org/10.1016/j.compedu.2010.03.013

Kokotsaki, D., Menzies, V., & Wiggins, A. (2016). Project-based learning: A review of the literature. *Improving Schools*, *19*(3), 267–277. https://doi.org/10.1177/1365480216659733

Krajcik, J., McNeill, K. L., & Reiser, B. J. (2008). Learning-goals-driven design model: Developing curriculum materials that align with national standards and incorporate project-based pedagogy. *Science Education*, *92*(1), 1–32. https://doi.org/10.1002/sce.20240

Krajcik, J., & Shin, N. (2014). Project-Based Learning. In R. K. Sawyer (Ed.), *The Cambridge Handbook of the Learning Sciences* (2nd ed., pp. 275–297). Cambridge University Press. https://doi.org/10.1017/CBO9781139519526.018

Leavy, P. (2017). *Research design: Quantitative, qualitative, mixed methods, arts-based, and community-based participatory research approaches*. The Guilford Press.

Lee, S. J., Ngampornchai, A., Trail-Constant, T., Abril, A., & Srinivasan, S. (2016). Does a case-based online group project increase students' satisfaction with interaction in online courses? *Active Learning in Higher Education*, *17*(3), 249–260. https://doi.org/10.1177/1469787416654800

Lou, Y., & Kim MacGregor, S. (2004). Enhancing project-based learning through online between-group collaboration. *Educational Research and Evaluation*, *10*(4–6), 419–440. https://doi.org/10.1080/13803610512331383509

Maor, D. (2003). The teacher's role in developing interaction and reflection in an online learning community. *Educational Media International*, *40*(1–2), 127–138. https://doi.org/10.1080/0952398032000092170

Meisani, D. R., & Rambet, R. D. B. (2017). Teachers' beliefs regarding language learner autonomy and practices of project-based education: A case study of an IndonesianEFL teacher. *NOBEL: Journal of Literature and Language Teaching*, *8*(2), 141–149. https://doi.org/10.15642/NOBEL.2017.8.2.141-149

Morales, T. M., Bang, E., & Andre, T. (2013). A one-year case study: Understanding the rich potential of project-based learning in a virtual reality class for high school students. *Journal of Science Education and Technology*, *22*(5), 791–806. https://doi.org/10.1007/s10956-012-9431-7

Papastergiou, M. (2005). Learning to design and implement educational web sites within pre-service training: A project-based learning environment and its impact on student teachers. *Learning, Media and Technology*, *30*(3), 263–279. https://doi.org/10.1080/17439880500250451

Parmelee, D. X., DeStephen, D., & Borges, N. J. (2009). Medical students' attitudes about team-based learning in a pre-clinical curriculum. *Medical Education Online*, *14*(1). https://doi.org/10.3885/meo.2009.Res00280

Picciano, A. G. (2002). Beyond student perceptions: Issues of interaction, presence, and performance in an online course. *Journal of Asynchronous Learning Networks*, *6*(1), 24. https://doi.org/10.24059/olj.v6i1.1870

Quintana, R., & Quintana, C. (2020). When classroom interactions have to go online: The move to specifications grading in a project-based design course. *Information and Learning Sciences*, *121*(7/8), 525–532. https://doi.org/10.1108/ILS-04-2020-0119

Reis, A. C. B., Zanette, A. C. D., & Barbalho, S. C. M. (2018). *A review of problem/project-based learning approach in engineering education: Motivations, results and gaps to overcome*. 302–308. https://www.researchgate.net/publication/318715699_A_bibliometric_and_classification_study_of_Project-based_Learning_in_Engineering_Education

Richardson, J. C., & Swan, K. (2003). Examining social presence in online courses in relation to students' perceived learning and satisfaction. *Online Learning*, *7*(1), 68–88. https://doi.org/10.24059/olj.v7i1.1864

Shadiev, R., Hwang, W.-Y., & Huang, Y.-M. (2015). A pilot study: Facilitating cross-cultural understanding with project-based collaborative learning in an online environment. *Australasian Journal of Educational Technology*, *31*(2), 123–139. https://doi.org/10.14742/ajet.1607

Shea, P., & Bidjerano, T. (2009). Community of inquiry as a theoretical framework to foster "epistemic engagement" and "cognitive presence" in online education. *Computers & Education*, *52*(3), 543–553. https://doi.org/10.1016/j.compedu.2008.10.007

Shea, P., Hayes, S., Vickers, J., Gozza-Cohen, M., Uzuner, S., Mehta, R., Valchova, A., & Rangan, P. (2010). A re-examination of the community of inquiry framework: Social network and content analysis. *The Internet and Higher Education*, *13*, 10–21. https://doi.org/10.1016/j.iheduc.2009.11.002

Shea, P., Li, C. S., Swan, K., & Pickett, A. (2005). Developing learning community in online asynchronous college courses: The role of teaching presence. *Online Learning*, *9*(4), 59–82. https://doi.org/10.24059/olj.v9i4.1779

Shih, W.-L., & Tsai, C.-Y. (2017). Students' perception of a flipped classroom approach to facilitating online project-based learning in marketing research courses. *Australasian Journal of Educational Technology*, *33*(5), 32–49. https://doi.org/10.14742/ajet.2884

Sidiropoulou, Z., & Mavroidis, I. (2019). The relation between the three dimensions of the Community of Inquiry and the learning styles of students in a distance education programme. *International Journal of Emerging Technologies in Learning*, *14*(23), 180–192. https://doi.org/10.3991/ijet.v14i23.11564

So, H.-J., & Brush, T. A. (2008). Student perceptions of collaborative learning, social presence and satisfaction in a blended learning environment: Relationships and critical factors. *Computers & Education*, *51*(1), 318–336. https://doi.org/10.1016/j.compedu.2007.05.009

Stefanou, C., Stolk, J. D., Prince, M., Chen, J. C., & Lord, S. M. (2013). Self-regulation and autonomy in problem- and project-based learning environments. *Active Learning in Higher Education*, *14*(2), 109–122. https://doi.org/10.1177/1469787413481132

Stozhko, N., Bortnik, B., Mironova, L., Tchernysheva, A., & Podshivalova, E. (2015). Interdisciplinary project-based learning: Technology for improving student cognition. *Research in Learning Technology*, *23*(1), 27577. https://doi.org/10.3402/rlt.v23.27577

Torres, A. S., Sriraman, V., & Ortiz, A. M. (2019). Implementing project based learning pedagogy in concrete industry project management. *International Journal of Construction Education and Research*, *15*(1), 62–79. https://doi.org/10.1080/15578771.2017.1393475

Tsai, M.-H., Chen, K.-L., & Chang, Y.-L. (2019). Development of a project-based online course for BIM learning. *Sustainability*, *11*, 5772. https://doi.org/10.3390/su11205772

Tseng, K.-H., Chang, C.-C., Lou, S.-J., & Chen, W.-P. (2013). Attitudes towards science, technology, engineering and mathematics (STEM) in a project-based learning (PjBL) environment. *International Journal of Technology and Design Education*, *23*(1), 87–102. https://doi.org/10.1007/s10798-011-9160-x

Tu, C.-H. (2001). How Chinese perceive social presence: An examination of interaction in online learning environment. *Educational Media International*, *38*(1), 45–60. https://doi.org/10.1080/09523980010021235

Urbach, N., & Ahlemann, F. (2010). Structural equation modeling in information systems research using partial least squares. *Journal of Information Technology Theory and Application*, *11*(2), 5–40.

Usher, M., & Barak, M. (2018). Peer assessment in a project-based engineering course: Comparing between on-campus and online learning environments. *Assessment & Evaluation in Higher Education*, *43*(5), 745–759. https://doi.org/10.1080/02602938.2017.1405238

van Rooij, S. W. (2009). Scaffolding project-based learning with the project management body of knowledge (PMBOK). *Computers & Education*, *52*(1), 210–219. https://doi.org/10.1016/j.compedu.2008.07.012

Williams, E. A., Duray, R., & Reddy, V. (2006). Teamwork orientation, group cohesiveness, and student learning: A study of the use of teams in online distance education. *Journal of Management Education*, *30*(4), 592–616. https://doi.org/10.1177/1052562905276740

Wu, S.-Y., Hou, H.-T., Hwang, W.-Y., & Liu, E. Z.-F. (2013). Analysis of learning behavior in problem-solving-based and project-based discussion activities within the seamless online learning integrated discussion (SOLID) system. *Journal of Educational Computing Research*, *49*(1), 61–82. https://doi.org/10.2190/EC.49.1.c

Xu, Y., & Liu, W. (2010). A project-based learning approach: A case study in China. *Asia Pacific Education Review*, *11*(3), 363–370. https://doi.org/10.1007/s12564-010-9093-1

Yilmaz, R., Yilmaz, F. G. K., & Keser, H. (2020). Vertical versus shared e-leadership approach in online project-based learning: A comparison of self-regulated learning skills, motivation and group collaboration processes. *Journal of Computing in Higher Education*. https://doi.org/10.1007/s12528-020-09250-2

Zhang, K., Peng, S. W., & Hung, J. (2009). Online collaborative learning in a project-based learning environment in Taiwan: A case study on undergraduate students' perspectives. *Educational Media International*, *46*(2), 123–135. https://doi.org/10.1080/09523980902933425

Appendix
Overview of the Measurements and their Constituent Items

Variable	Item
Instructional Design and Organization	The instructor clearly communicated important course topics (e.g., provided clear overview of the course).
	The instructor clearly communicated important course goals (e.g. provided a clear and accurate course overview).
	The instructor provided clear instructions on how to participate in course learning activities (e.g., provided clear instructions on how to complete course assignments successfully).
	The instructor clearly communicated important due dates/time frames for learning activities.
Directed Facilitation	The instructor was helpful in guiding me towards understanding course topics in a way that helped me clarify my thinking.
	The instructor helped to keep me engaged and participating in productive dialogue.
	The instructor helped keep the course participants on task in a way that helped me to learn.
	The instructor encouraged course participants to explore new concepts in this course.
	The instructor helped to focus discussion on relevant issues in a way that helped me to learn.
	The instructor provided feedback that helped me understand my strengths and weaknesses relative to the course's goals and objectives.
	The instructor provided feedback in a timely fashion.
Social Presence	I felt comfortable participating in the course discussions (e.g., group discussions and other course activity discussions).
	I felt comfortable interacting with other course participants.
	I felt comfortable conversing through the online medium.
	I felt comfortable disagreeing with other course participants while still maintaining a sense of trust.
	Online or web-based communication is an excellent medium for social interaction.
	Getting to know other course participants gave me a sense of belonging in the course.
	I was able to form distinct impressions of some course participants.
	I felt that my point of view was acknowledged by other course participants.
	Online discussions help me to develop a sense of collaboration.
Cognitive Presence	Online discussions were valuable in helping me appreciate different perspectives.
	Reflection on course content and discussions helped me understand fundamental concepts in this class.
	Combining new information helped me answer questions raised (by the teacher and fellow students) in course activities.
	Learning activities helped me construct explanations/solutions.
	Problems posed (by the teacher and fellow students) increased my interest in course issues.
	Brainstorming and finding relevant information helped me resolve content related questions.
	I felt motivated to explore content related questions.
	Course activities piqued my curiosity.
	I can apply the knowledge created in this course to my work or other non-class related activities.

Overview of the Measurements and their Constituent Items

	I utilized a variety of information sources to explore problems posed (by the teacher and fellow students) in this course.
	I have developed solutions to course problems that can be applied in practice.
	I can describe ways to test and apply the knowledge created in this course.
Perceived Benefits	This group activity assisted me in learning new knowledge and skills.
	This group activity assisted me in understanding other/different points of view.
	This group activity assisted me in better understanding course materials.
	This group activity assisted me in learning more knowledge.
	This group activity assisted me in improving my thinking ability.
Satisfaction	This group activity assisted me in effectively using my study time.
	In general, this group activity was a useful learning experience.
	In general, this group activity met my learning expectations.
	In general, I am satisfied with this group activity.
	If this group activity will be offered in other courses in the future, I would like to take it.
	I am willing to recommend this group activity to others.

Faculty as Designers of Authentic Learning Projects in Online Courses

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Abstract
This study investigated similarities and differences in faculty's interpretation of authentic learning and how their interpretations were manifested into their design and implementation practices in competency-based, fully online courses. From a theoretical perspective, designing for authentic learning calls for a holistic approach, which considers various aspects, such as real-world relevance, personal meaningfulness, authentic assessment, disciplinary authenticity, and teacher authenticity. In terms of similarities across participants in this study, most faculty interpreted authentic learning as including "real-world" characteristics -- that is, authentic learning is a type of learning that is situated in real-world contexts and is relevant to learners' future careers. In terms of differences, only a few participants emphasized that authentic learning requires removing the dichotomy of a hierarchical classroom environment based on the principles of co-learning. The findings of this study also highlighted examples of authentic learning and challenges associated with implementing authentic learning in competency-based online courses. The study further provides implications for future research and practice.

Keywords: Authentic learning, online instructional design, faculty experiences, public health competency-based courses

Authentic learning has been discussed as a pedagogical strategy to situate learning in real-world contexts (Brown et al., 1989; Choi & Hannafin, 1995; Herrington et al., 2014; Kreber et al., 2007; Newmann & Gamoran, 1996; Paddison & Mortimer, 2016; Stefaniak, 2020; Wald & Harland, 2017). Particularly, Vo et al. (2018) argued that improving learning authenticity, or in other words, "reducing the gap between what [is] being taught at school and what [is] being used in the real world" (p. 391), is one of the challenges in higher education courses. Further, according to Herrington and Oliver (2000), knowledge should not be regarded just as the final product of education but rather a powerful tool for solving real-world problems. Due to the "real-world" characteristic of authentic learning, learners have an opportunity to apply concepts and problem solve in real-world contexts, which increase learner intellectual engagement. (Baldwin, 2019; Paddison & Mortimer, 2016). Further, Wald Harland (2017) stated that the approach of giving learners opportunities to apply knowledge in real-world contexts allows them to create knowledge and innovate in their chosen professions after graduation. Various empirical studies provided examples of authentic learning in online courses and reported its benefits (Devine et al., 2020; Houke, 2017; Lai et al., 2017; Lee, 2020; Loucks & Ozogul, 2020; Lowell & Moore, 2020; Luo et al., 2017; Ozverir et al., 2017; Peng et al., 2017; Trespalacios, 2017; Vo et al., 2018; Watson et al., 2017).

Authentic learning has a rich array of meanings and interpretations (Cranton & Carusetta, 2004; Lehman & Kovacs, 2019; Shaffer & Resnik, 1999), and may be manifested through a variety of different designs and implementations, such as: (1) project-based learning, including projects with a real client (Deale et al., 2010; Houke, 2017; Fitzsimmons, 2006; Lowell & Moore, 2020; Parry & Reynoldson, 2006; Peng et al., 2017); (2) capstone projects (Collis et al., 2009); (3) studio pedagogy (Clinton & Rieber, 2010); (3) case-based learning (Ferry et al., 2006; Miner-Romanoff et al., 2017; Trespalacios, 2017; Vo et al., 2018); (4) realistic simulated learning activities (Koenders, 2006; Ozverir et al., 2017); and (5) field experiences (Schumacher & Reiners, 2013). In addition to these multiple interpretations and different implementation approaches, online delivery formats may pose challenges for the implementation of authentic learning. For instance, a few challenges were reported in the literature: (1) difficulty managing group work; (2) comparatively high workload due to written communication and time spent on managing discussions; and (3) teaching and assessing interpersonal elements (Smith et al., 2009; Woo et al., 2007). Specifically, scaffolding and interactions are thought to be key in supporting authentic learning in online courses (Collis et al., 2009). However, further research is still needed to detail how authentic learning is designed and implemented in a variety of online contexts (Lowell & Moore, 2020; Vo et al., 2018). Thus, this study is situated in the context of public health training to detail faculty's interpretation and design practices of authentic learning in online courses.

In the United States, most public health training programs are informed and accredited by national standards (Meredith et al., 2020), with the most recent accreditation standards released in 2016 by the Council on Education for Public Health (CEPH, 2016). These standards set forth competencies that reflect the practical realities of the work of public health professionals, and training programs place a significant emphasis upon authentic learning to meet those national accreditation standards. Regardless of whether they are taught face-to-face or online, public health training programs need to be designed to help students produce artifacts or products that demonstrate the mastery of these competencies. Faculty designing and teaching competency-based courses have an important task to ensure that learning experiences in public health courses help students acquire these required competencies.

This study is significant because it was focused on investigating public health faculty's design and implementation practices to meet accreditation standards while using authentic learning in a fully online graduate program, and how their interpretations of authentic learning were manifested in their courses. Other faculty interested in competency-based education in public health and other content areas can use the findings of this study to understand how authentic learning is conceptualized in the given context. Scholars and practitioners in the instructional design technology (IDT) discipline can use the findings of this study to inform their educational practices in preparing future instructional designers who will collaborate with faculty on the design of online courses in diverse content areas. Instructional designers can also gain insights from this study that would allow them to implement research-driven instructional design (ID) practices (Lachheb & Boling, 2018; McDonald & Stefaniak, 2020; Tracey & Boling, 2014).

Literature Review

Integration of authentic tasks is one of the best practices to effectively engage students in online courses (Britt et al., 2015). Authentic learning materials and activities relevant to practice have been reported to be one of the key design elements in award-winning online courses (Kumar et al., 2019). Additionally, scholars have discussed that authentic learning relates learners to real-world problems and future professions (Baldwin, 2019; Britt et al., 2015; Herrington at al., 2010; Watson et al., 2017). Various authors have reported the benefits of authentic learning in online courses, including improved intellectual student engagement and the acquisition of knowledge and skills that go beyond course learning outcomes (Baldwin, 2019; Devine et al., 2020; Herrington et al., 2003; Houke, 2017; Lai et al., 2017; Lee, 2020; Loucks & Ozogul, 2020; Lowell & Moore, 2020; Luo et al., 2017; Ozverir et al., 2017; Peng et al., 2017; Smith & Kennedy, 2020; Trespalacios, 2017; Vo et al., 2018; Watson et al., 2017). For instance, Trespalacios (2017) investigated students' perceptions of case-based analysis and discussions in an online instructional design (ID) course and concluded that the use of case studies drawn on real-world examples enhanced the students' learning of instructional design. Another empirical study conducted by Ozverir et al. (2017) investigated the use of authentic activities in an English as a Foreign Language (EFL) online class and examined how the use of authentic activities helped students achieve foreign language competency (i.e., B1- intermediate English). The learning activity used within the study was designed based on the key characteristics of authentic learning, such as an ill-defined task that has real-world relevance, which draws students into collaborative and reflective learning. The authors concluded that authentic learning tasks allowed students to purposefully use the target language in context, which contributed to their expansion of vocabulary and pragmatic use of the language.

In another example of authentic learning in online courses, Vo et al. (2018) investigated students' perceptions of authentic learning materials and tasks, particularly their effectiveness in supporting students' learning in an online sociology course. The authors included real-world examples to spark students' curiosity about the topics being covered, such as pieces of news or videos. Additionally, the authors incorporated authentic examples that served as models for students and helped them make a connection between the concepts and real-world issues. Further, the students were asked to complete a hands-on project, which involved collecting raw data from the environment around them. Upon completion of the course, students shared that discussing real-world issues in the course, along with hands-on assignments, positively impacted their learning.

Other empirical studies focusing on authentic learning in online courses claimed that authentic learning enabled more contextually relevant learning (Loucks & Ozogul, 2020; Lowell

& Moore, 2020), which provided learners with opportunities to solve complex real-world problems relevant to a particular professional practice (Finch & Jefferson, 2013; Koenders, 2006; Ladyshewsky & Ryan, 2006; Miner-Romanoff, et al., 2017). That is, authentic learning prepares learners to apply their knowledge and skills to future professional practice.

Practices of Designing Authentic Learning in Online Courses

As there is no single definition of authentic learning (Newmann et al.,1996; Roach et al., 2018; Shaffer & Resnick, 1999; Stoddard et al., 2015; Wald & Harland, 2017), the term is subject to different interpretations (Fougt et al., 2019; Herrington et al., 2003). Commonly, authentic learning has been discussed as an eclectic pedagogy that centers on the philosophy of "learning by doing" in real-world contexts (Brown et al., 1989; Choi & Hannifin, 1995; Herrington et al., 2014; Kreber et al., 2007; Newmann & Gamoran, 1996; Paddison & Mortimer, 2016; Wald & Harland, 2017). Shafer and Resnik's (1999) work introduced the term of *thick* authenticity, which includes the following four meanings: relevance to real-world, authentic assessment, disciplinary, and personal authenticity. Fougt et al. (2019) recommended augmenting the *thick* authenticity by including a fifth meaning: teacher authenticity. According to the authors, teacher authenticity refers to teacher's genuine interest in the subject matter, learning activities, and student success.

There are several frameworks to use when designing authentic experiences in online courses. Herrington and Oliver (2000) offered a framework consisting of nine design elements of situated learning environments. That is, students should be situated in an authentic context that encourages them to apply knowledge the way it is used in real life. In addition, students should be given authentic tasks and have access to modeling, coaching, and expert knowledge. Such a learning environment should provide students with opportunities to consider multiple perspectives, collaborate with each other, and reflect on their learning experiences.

Further, when designing for authentic learning, it is important to ensure that authentic activities center on ill-defined, complex, and real-world tasks. Such authentic tasks should allow students to analyze given problems from multiple perspectives and devise multiple solutions (Herrington et al., 2007; Herrington et al., 2010; Herrington et al., 2004; Herrington & Reeves, 2003). During such learning experiences, students should have access to expert knowledge and modeling while working independently on challenging problems and creating their own solutions (Herrington et al., 2010). Herrington et al. (2004) concluded that the nature and degree of authenticity is the result of the teachers' and instructional designers' perspectives and imaginations.

In addition to the above-described design guidelines, Hickey et al. (2020) offered insights into the design of online and hybrid courses that center on real-world cases and are meaningful to students. While the authors did not explicitly mention authentic learning, Hickey et al. (2020) discussed the importance of framing instruction into real-world cases, problems, and examples. The real-world nature of instruction is a key feature of authentic learning (Brown et al., 1989; Herrington et al., 2014; Herrington et al., 2020; Honebien, 1996; Shaffer & Resnik, 1999; Stefaniak, 2020). Hickey et al. (2020) particularly referred to three expansive framing design principles: (1) learners should make meaning of their own learning by themselves; (2) instructors should help learners keep themselves responsible for their learning and participation in the discourse related to a specific discipline; and (3) learners should be agents rather than passive consumers of disciplinary knowledge.

Overall, in authentic learning environments, each learner should be encouraged to find connection with real-world situations, engage in solving challenging problems individually and

collaboratively, and reflect on their learning. While such design guidelines can provide initial insights into the design process, design guidelines or models should be applied with a thoughtful consideration of a learning context and situation. As Gibbons et al. (2014) emphasized, strictly focusing on fitting a specific design situation to a particular design model or prescriptive steps can result in ignoring the uniqueness of a given learning context. Doing so could lead to a stereotyped approach to designing and, ultimately, ineffective learning. Additionally, Fougt et al. (2019) emphasized that authentic teaching exists as an act of balancing between different components of authenticity and that authentic teaching is situational. Therefore, no prescriptive steps could ensure authenticity in a particular course without taking the full actuality of the teaching context into account.

Competency-Based Education

Authentic learning is often intertwined with "competency-based education," which structures academic content and designing assessments based on specific competencies, i.e., a student's practical knowledge and skills (Oroszi, 2020). It originated from medical education and health related professions (McGaghie et al., 1978), and it is built around "functions" or competencies required for practice in a given professional setting (McGaghie et al., 1978). A competency-based approach entails innovative ways to design curricula to equip students with strategic skills and practices consistent with community and workforce needs (Coombe et al., 2020; Meredith et al., 2020; Pfeiffer et al., 2013). In the context of public health training, the CEPH accrediting body (CEPH, 2016) strongly emphasizes competencies. For example, students must "assess a specific community's strengths, challenges, and the desired outcomes that are necessary for community well-being" (p.1). Further, for the competency "Design a population-based policy, program, project or intervention," students must create a product such as "a research project, plan for a program, policy statement, etc." (p.2). This can be achieved through "co-production of authentic work (needs assessments, epidemiologic profiles, conceptual frameworks, project plans, grant proposals, M&E [Monitoring and Evaluation] frameworks) with and for community partners." (Meredith et al., 2020, p. 91). To develop and demonstrate such competencies, students need to have opportunities to bridge theory and practice in authentic contexts through experiential and hands-on learning projects, such as community engagement or service-learning projects (Anderson et al., 2020; Gakh, 2020; Cribbs et al., 2020; Hou, 2009; Pendergrast 2020; Rhodes et al., 2020).

The Current Study

Overall, the literature highlights authentic learning as one of the key components for successful online courses. In practice, authentic learning design principles emphasize student-centered learning environments that allow each learner to find connection with real-world situations, engage in solving challenging problems individually and collaboratively, and reflect on their learning. Taking into the consideration the above key points from the literature review, the following research questions guided the study:

(1) What are similarities and differences in faculty's interpretation of authentic learning in competency-based online courses?
(2) What practices do faculty use to design authentic learning within their competency-based online courses?
(3) What challenges do faculty report in designing and teaching integrated authentic learning for competency-based online courses?

Methods

Context of the Study

The study took place within several graduate competency-based public health courses taught within the Master of Public Health (MPH) online program at a large midwestern university. The program includes a variety of concentrations such as Public Health Administration, Environmental Health, and Epidemiology; all are accredited through CEPH and thus are required to align courses competencies with assessments. MPH students share core required courses and specific courses based on their concentration. Faculty members are encouraged to collaborate with instructional designers to ensure the alignment between competencies, course learning objectives, and assessments. The School of Public Health at the given university has a support unit which provides instructional design support for faculty designing online courses. As the MPH program is also offered online, the courses were initially designed as online courses, and were studied in 2019 before the university pivoted to full-scale remote instruction due to COVID-19. All courses were delivered through a university supported learning management system, were 16 weeks long, and had a maximum enrollment of 20 students.

Study Design and Instruments

To answer the above listed research questions, this study followed a mixed-method explanatory sequential design (Creswell & Clark, 2018), using both a quantitative survey and a qualitative interview approach. The goal behind using quantitative and qualitative methods was to provide rich and insightful answers to the posed research questions (Fraenkel et al., 2011). To ensure trustworthiness of the study, we recruited two faculty from the targeted participant group from the School of Public Health to pilot test both the survey and interview protocol. Pilot testing of the instruments allowed us to refine them by making changes such as formulate questions more clearly and avoid leading questions.

For the quantitative portion, we developed a questionnaire based on the literature about authentic learning (reviewed above) to capture all faculty members' insights about authentic learning in an efficient way). The questionnaire asked participants to indicate years of teaching online, content area, and level of teaching, undergraduate or graduate. It also included questions related to how they would describe authentic learning, types of authentic learning they implemented in their courses, and questions to indicate their level of agreement/disagreement with the following statements:

1. Authentic learning tasks should situate knowledge and skills in the context of future professional use.
2. Authentic real-world projects relevant to the context of public health help prepare students better for their future job.
3. Authentic learning is more suitable for graduate-level courses.
4. It is difficult to integrate authentic tasks in my content area.
5. Authentic learning is more difficult to integrate in online courses than in face-to-face courses.
6. Authentic learning provides opportunities for students to apply their knowledge in real-world contexts.

7. Authentic learning immerses students into practices and social interactions relevant to their future profession.

For the qualitative stage of data collection, we designed a semi-structured interview protocol which built from the survey results. That is, we analyzed the survey data, reflected on the responses, and then devised interview questions that would allow participants to elaborate further on authentic learning and their experiences designing and implementing it in their online courses. Questions in the interview protocol were organized into three sections: (1) questions related to participants' background (e.g., educational, professional); (2) questions related to their interpretations of authentic learning; and (3) questions regarding examples of authentic learning in their courses, including the design and implementation. After conducting the interviews, we did member checking with all participants, with two additional coders checking the qualitative data analysis.

Study Participants
Through the school's public health website and university course catalog, 22 out of 60 public health faculty were identified as teaching online graduate competency-based courses and were invited to participate in the study. The recruitment email explained why they were invited to participate in this study, the purpose of the study, what participants would be asked to do (such as complete a quick questionnaire and a follow-up interview, if they preferred), and a study information sheet. Thirteen of the 22 faculty responded to the questionnaire and agreed to participate in the study. The questionnaire also asked whether they would like to participate in a follow-up, semi-structured interview, and ten faculty agreed to participate in the interview. We were unable to link survey and interview responses due to the anonymity of survey respondents. We refer to the two overlapping groups of respondents as "survey respondents" (N = 13) and "interview participants" (N = 10).

All 13 questionnaire respondents had varying years of teaching experience, including teaching competency-based courses: Six faculty had one to two years of experience, three faculty had three to five years of experience, three faculty had six to 10 years of experience, and one faculty member had more than 10 years of experience. The faculty taught a variety of graduate courses in behavioral, social, and community health, biostatistics, public health administration, environmental health, physical activity, and recreation, park, and tourism studies.

Table 1 summarizes key characteristics of interview participants. While most (8 out of 10) had prior online teaching experience, it was the first time that they designed and implemented authentic learning in online competency-based courses (CEPH courses) that were subject to accreditation. One faculty member is a professor of gerontology courses, who offered her gerontology courses as elective in the MPH program. This faculty member's course was designed based on the competencies put forth by the Academy for Gerontology in Higher Education (AGHE).

Table 1

Characteristics of Interview Participants

Faculty/Participant #	Years of Teaching Online	Title	Content area
1	2	Adjunct Instructor	Public Health Administration
2	2	Professor	Behavioral, Social, and Community Health
3	5	Associate Professor	Epidemiology and Biostatistics
4	20	Professor	Behavioral, Social, and Community Health
5	10	Professor	Public Health Administration
6	3	Associate Professor	Public Health Administration
7	3	Assistant Professor	Behavioral, Social, and Community Health
8	6	Associate Professor	Physical Activity
9	6	Associate Professor	Physical Activity
10	3	Full-time Instructor	Environmental Health

Data Analysis

Descriptive statistics were used to analyze the data gathered from the questionnaire. Saldaña's multiple cycles of coding (2015) process was used to analyze the interview data. The purpose of using the Saldana method (2015) was to look at the data holistically and identify trends and patterns in aggregate responses. In the first cycle of the data analysis, we used concept codes to code a transcript for each interview. Concept codes were words or short phrases that symbolically represented a suggested meaning for the statement of each participant. These concept codes were the result of our interpretative act of the data and not based on a pre-existing coding book or a coding sheet. After we coded statements for each participant, we used axial coding to group similarly coded data, reduce the number of codes, and construct conceptual categories that were broader. Further, we grouped themes generated from multiple participants into more abstract categories to generate an overarching theme.

Findings

RQ1: What Are Similarities and Differences in Faculty's Interpretation of Authentic Learning in Competency-Based Online Courses?

The majority of survey respondents (92%) agreed with the statements that authentic learning should have the following four characteristics: (1) be related to the real world; (2) be personally meaningful; (3) model disciplinary practices; and (4) be aligned with assessment. Despite this overall agreement, when they were provided the opportunity to further elaborate in further survey and interview responses, some faculty emphasized some characteristics more than others, as discussed below.

Across both the survey and interviews, most faculty strongly emphasized that authentic learning should be situated in real-world contexts and related to future profession. Survey responders indicated that authentic learning should situate knowledge in the context of professional future use (77%), should provide opportunities for students to apply their knowledge in real-world contexts (92%), and should immerse students into practices and social interactions relevant to their future profession (85%). Interviewees shared similar insights. For instance, interviewees stated:

> Real-world is different, and that's really what I mean by authentic learning too is that we've moved this false dichotomy, we crashed the false dichotomy between real-world and classroom.

> Authentic learning is a type of learning that is relevant to their career, real life, it's situated in a real-life situation. It's not constructed artificially for the purposes of a classroom.

In interviews, four faculty also emphasized the meaningfulness of authentic learning, which they clarified by stating that it should be personally meaningful for students. For example, one interviewee stated:

> Authentic learning is a learning space where learners can find their own learning path and identify with something because of their own self that they bring to the learning space. It is authentic in that way, and that it is true to me, the learner.

Two interviewees also brought up an idea of learning community and culture of co-learning when talking about authentic learning. For instance, an interviewee said:

> Authentic learning to me is learning that is practical, that is applied to real world settings, that is iterative, meaning that everyone contributes to the learning community, and the curriculum develops from that organism that is a group.

RQ (2) What practices do faculty use to design authentic learning within their competency-based online courses?

Across the 13 survey respondents, 85% indicated that they most frequently designed a project with a real organization as a type of authentic learning in their online courses. In addition, most survey respondents indicated that they designed case-based instruction based on real data/events (69%), community engagement or service learning (62%), or research into practice projects (62%).

Interviewees' insights allowed us to analyze how their interpretations of authentic learning manifested in their design and implementation practices, resulting in two key themes. First, most interviewees discussed how to situate authentic learning in real-world contexts and students' future profession, and second, four interviewees discussed how authentic learning could be made personally meaningful for students. These two themes are explored in more detail below.

Theme 1: Designing Activities Relevant to Students' Future Profession

When further discussing the design of authentic learning, interviewees stressed the importance of making learning activities in the course relevant to students' future careers. In this regard, designing courses in compliance with the competencies put forth by the public health professional organizations automatically made learning relevant and authentic. Particularly, one interviewee said:

> You just have to be creative about how to create assignments to map on these competencies that are authentic in the eyes of the students. I think that aligning the learning activities and tasks to the competencies automatically makes them relevant to what is seen as something important to the public health practice.

Interviewees stated that competencies guided the design. As such, interviewees mentioned that they broke down competencies into learning objectives. Further, it was important they made sure competencies, learning objectives, learning resources, activities and assessments were aligned. For checking for alignment, five interviewees shared that they created a design matrix with instructional designers. The design matrix served as a key design document used as the master plan for the course design process, aimed at ensuring a strong alignment between learning outcomes, assessments, and course competencies while integrating authentic learning in competency-based online courses. As such, one interviewee stated that working with instructional designers allowed them to ensure such alignment. Specifically, one interviewee stated:

> I feel I've been very advantaged in the last five years working with instructional designers who have helped me better relate designing these activities to specific course learning outcomes rather than just sort of vaguely associate them with the goal of a course. I think what I heard was how much they [students]appreciated the real-life experience, how much they liked getting out of the kind of the format online, week to week.

Interviewees were asked to share examples of authentic learning projects they implemented in their online competency-based courses. In designing their competency-based courses, interviewees relied mostly on asynchronous activities, such as asynchronous discussion. For example, one interviewee gave an example of a class discussion in which an interviewee/faculty member encouraged students to relate the concept (e.g., life course perspective) to their own lives and incorporate their own experiences in their discussion.

Similarities in interpretation of authentic learning among interviewees manifested in their practices of designing and implementing application projects. As such, interviewees gave the following examples of application authentic learning projects: (a) Projects with a real organization, (b) case-based instruction rest on real data or events, and (c) research into practice.

When it comes to designing the above listed authentic learning, interviewees shared that it was crucial that they were able to find sites (e.g., real clients or projects) for such authentic learning projects. Interviewees stated that they first explored options available in communities nearby campus, such as local hospitals, assisted living residences, public health organizations, or local legislatures. In cases when most students were in different places, students were tasked to look for organizations in their own communities with which to work on a project. If students could not find a client to work with, faculty provided necessary resources to help students find a client via distance.

Case-based instruction with real data or events included analysis of various cases related to real-world situations. It included discussions centering on real-world issues happening in the field of public health, such as recent news or issues taking place at a community, state, or

national level (e.g., outbreaks of infectious disease and the role of vaccination, access to clean water, health care access, Medicaid/Medicare extension). Faculty gave two examples of class discussions revolving around the most current and pressing issue in public health. They also needed to account for online nature of learning environment. They and their students needed to leverage online resources, such as virtual tours, online video conferencing tools for getting connected to organizations/clients and using the CourseNetworking platform for interacting and discussing real-world issues.

Theme 2: Designing Personally Meaningful Authentic Learning from Students' Point of View in the Environment of Co-Learning

In ensuring personal meaningfulness of learning, interviewees emphasized the importance of considering students' feedback from previous semesters in the design process. In addition, students should be surveyed before the semester or right at the beginning of the semester to identify their interests and what particular public health issues mattered to them. Thus, in courses, authentic learning was designed based on students' expressed interests captured through a survey and through an open dialogue between students and faculty.

One interviewee stated that their design practice was to blend course competencies with students' interests and personal experiences. They stated that it might have been easier to do in their policy and politics class, since topics were relatable to students on a personal level. For instance, in one of the online competency-based classes, the interviewee assigned students to prepare a policy brief that advocated for an issue that was dear to students (e.g., they had personal experience with a specific health issue). This interviewee stressed,

> I think authenticity in learning is really more about the learner in the environment and what the environment provides to link in with the learner.

One of the key differences in interpreting authentic learning among interviewees was the idea of co-learning that two interviewees stressed. As such, one interviewee stressed that at the heart of designing authentic learning was removing the dichotomy of a hierarchical classroom environment based on the principles of co-learning, with students learning from the professor and the professor learning from students. This interpretation of authentic learning was manifested in discussion-based activities, in which a faculty member constantly involved students to share their input and perspectives regarding concepts and topics being discussed, as well as allowing them to lead discussion. One such activity was a synchronous mind-mapping activity to facilitate students' metacognitive abilities. Specifically, interviewees stated:

> As a professor, if I am not a part of the learning, then I feel like I'm not doing my job well. I rarely in conversation use the word learning or teaching as separate ideas. I talk about how I engage in the process of learning and teaching. I often will share things with my students about the joy I have in learning alongside them and being taught by them. So, it should be authentic to everybody because it's authentic interaction.

> I think back to this whole hierarchy of learning, yes, I will evaluate their work. They're going to evaluate the work, too. They do a lot of co-evaluation, and then they become really sharper doing that. But they teach me something, too. And that's the pieces we call co-learning in a learning environment with opportunities for applied development.

RQ3: What Challenges Do Faculty Report in Designing and Teaching Integrated Authentic Learning for Competency-Based Online Courses?

Most survey respondents (62%) indicated that authentic learning was more difficult to integrate in online courses compared to face-to-face courses. Thematic analysis of the interview data provided further insight into this finding. The following three themes were constructed regarding challenges of designing and implementing authentic learning in online competency-based courses: (1) time commitment and pre-planning; (2) different geographic locations of students to arrange authentic learning; (3) lack of real-world, face-to-face interactions with students.

Theme 1: Time Commitment and Pre-Planning

Since faculty taught competency-based courses that were subject to accreditation and considered high-stake courses, they reported the need to collaborate with instructional designers on course design. Instructional designers' expertise was especially necessary to ensure the alignment of learning activities with assessment, as well as to ensure the authenticity and relevancy of projects in meeting the required competencies. Further, because the authentic learning was to be delivered in an online format, the design process required a considerable time commitment for pre-planning. As two participants shared, pre-planning did not work with certain authentic learning tasks, such as discussing the most current news, issues, and events in the field of public health. Thus, as two faculty specifically noted, faculty should be willing to leave some activities unfinished and complete them as those current events progressed and resolved.

While this challenge is not unique specifically to the design for authentic learning in online courses, it is worth noting the courses were designed around specific competencies put forth by the accrediting body. As one of the participants specifically pointed out, knowing that those competencies were put forth based on what was seen as "must have" by public health professionals helped them feel more reassured about their design and teaching practices. Therefore, the majority of participants did not report any factors that would impede designing and implementing authentic learning, but they referred to the limitations of the online delivery mode when implementing authentic learning.

Theme 2: Different Geographic Locations of Students to Arrange Authentic Learning

Additionally, faculty stated that it was difficult to organize and arrange authentic learning activities when students were in different geographic locations. For example, a faculty member shared the following observation:

> In face-to-face classes, it's possible to do some field trips, for example, to local communities where students meet with community members and organizations within that community. Students could be exposed to more real-world health issues than what they chose to focus on in the online course. However, in online, students still work in their community with community members and organizations, but on projects they find.

Further, synchronous online activities were crucial for authentic learning tasks for collaborative knowledge construction in online authentic learning environments (Herrington et al., 2010). That is, one of the participants used a synchronous mind-mapping activity with students in class to help them organize their ideas about a policy brief assignment. Collaborative knowledge construction was more challenging to do in an online course, since students were in different physical locations and time zones, thus, not everyone was able to participate.

Theme 3: Lack of Real-world, Face-to-Face Interactions with Students

When it comes to teaching integrated authentic learning, three faculty noted that it was not more difficult to do than in face-to face courses. The other seven faculty stated that teaching integrated authentic learning online was more challenging than in face-to-face classes. Even though authentic learning implies an open-ended nature of projects in which contexts and tasks should not be simplified, students still need to have access to expert knowledge and coaching (Herrington et al., 2010). According to the faculty, didactic materials, such as lectures, served as expert knowledge and coaching for students, and were easier to deliver in a face-to-face setting, since it allowed for live interactions. That is, due to the lack of real-world interaction with students, faculty felt there were not enough opportunities to get to know students well and monitor to what extent students comprehended and saw value in a particular authentic learning project. Particularly, a faculty stated:

> There's always a disconnect, especially for undergrad students, because even though we put it there, if they don't read it, they don't get it. In an online environment, you have to rely on them to see it, read it, comprehend it, and you don't get that face-to-face engagement.

To help students navigate through the authentic learning, faculty indicated that students still needed to be provided with clear structure and scaffolding through well-composed and well-presented instructions on a course site. As one faculty noted:

> An LMS needs to be well designed, presented well to the students. Also, clear directions and expectations should be included, and at the same time leaving room for students to create their own projects.

Discussion

The purpose of this study was to investigate public health faculty's design and implementation practices to meet accreditation standards while using authentic learning in a fully online graduate program, and how their interpretations of authentic learning were manifested in their courses. One of the key findings was that there were similarities and differences in interpreting authentic learning among participants. The key similarity in interpreting authentic learning across participants was the real-world characteristic of authentic learning. That is, authentic learning is a type of learning that is situated in real-world contexts and relevant to learners' future careers.

Similarity of interpretations of authentic learning could be because participants/faculty designed in the same public health learning context. Interestingly, as described in the findings, participants gave different examples showing that authentic learning projects differed in their nature. This may speak to the importance of core teacher beliefs (Ertmer et al., 2012) and core design judgments (Nelson & Stolterman, 2014) which are unique to each faculty.

Participants also offered different interpretations of authentic learning, such as authentic learning is a type of learning that is personally meaningful. This interpretation of authentic learning manifested in aligning course projects with student interests. This is a difficult balance to strike when designing authentic learning—that is, designing learning experiences that should be both personally meaningful and discipline-relevant for students who could come from diverse backgrounds. This practice presents a challenging design situation or problem (Nelson &

Stolterman, 2014), and in such challenging design situations, there is no one right design solution and outcome. Additionally, when using feedback from previous semesters, it is important to avoid stereotypical representation of student population in each course. A generalized student persona might not capture unique characteristics and experiences of learners, which raises the issue of equity and inclusion.

Other different interpretations of authentic learning included the absence of power hierarchy between faculty and students. That is, authentic learning provides a co-learning environment in which students learn from professors and vice versa. This is something that was not highlighted in the reviewed literature, as the major focus was placed on students. This interpretation of authentic learning maybe related to students being adult learners in this context. We speculate that professors who treat their students like peers may increase the buy-in from the students and may also increase student engagement in online courses.

It is worth noting that in the given context, differences in faculty's interpretation of authentic learning did not appear problematic. That is, whether students worked with a real client or analyzed cases based on real data, such projects were aligned with accreditation standards. It could potentially be problematic if differences in interpretation of authentic learning led to design and teaching practices not up to par the accreditation standards. It is also worth noting that this study was situated in competency-based courses. For us, this means that competencies set forth by professional organizations provided cognitive offloading to some extent, particularly in regard to thinking through and researching what was relevant and, thus, authentic. However, at the same time, it takes effort to design various authentic learning that allows students to make meaning of it. In addition, faculty needed to strike a good balance between instructor support and student autonomy over their learning. For us, the authors of this study, the creative aspect of design that faculty noted implies an iterative process. This iterative design process is inevitable in finding a balance among needed instructional support, access to expert knowledge (Herrington et al., 2010), and student agency of their learning experience. Additionally, Correia et al. (2010) stressed the challenge between balancing instructional support and allowing students to take ownership of their learning.

Another interesting insight that struck us was the need for a physical environment for authentic learning in the given fully online courses. While discussing the design practices, the faculty noted that they needed to find a physical site for students or direct them to resources or advice or a contact to find a place for their authentic learning. This finding resonates with Herrington's et al. (2010) design framework, which asserts that, in online authentic learning environments, a learning context should provide "a physical environment which reflects the way the knowledge will ultimately be used" (p. 20). At the same time, Herrington et al. (2003) discussed the importance of *cognitive realism* in online authentic learning environments. That is, they specifically discussed how the major emphasis should be placed upon the design of authentic, intellectually stimulating tasks in virtual reality environments, rather than recreating the real setting through graphics and interface designs. If following the same logic for the design of authentic learning in online courses, should this learning experience be tied to a specific physical environment? This invites the following questions: (1) Why was there a need to ground online authentic learning experiences in a physical face-to-face environment? In this case, while students have physical presence with clients, are they still engaged in an online authentic learning experience? (2) To what extent do students have equitable learning experiences if they have unequal affordances in finding an organization to treat as a client? (3) What online resources are easily accessible and could be leveraged to promote equity among students?

Additionally, we find it noteworthy that the support and role of instructional designers was noted by the faculty members. The role of instructional designers was specifically noted in ensuring the alignment of competencies and assessments, as well as ensuring the relevancy and authenticity of learning experiences. This is an important insight as to how faculty can be supported in their institutions when designing online courses, for instance, designing courses aligned with national standards and that are subject to accreditation.

Implications for Research

Findings of this study highlight the link between interpretation of the term of authentic learning and design and teaching practices. According to the study findings, faculty embedded their meaning of authentic learning into the design and teaching of their courses. We can see the variance in their design practices based on their interpretation of authentic learning. Therefore, future research can investigate the role of faculty in designing authentic learning and the core teaching beliefs and judgements they bring into the design of authentic learning. The way practitioners operate with terms might be different from the way they are presented or explained in the literature, thus, a closer look into the practitioner's professional activities can provide insights as to how practice can inform theory and where theory lacks practitioners' perspectives.

Based on the theory, multiple aspects should be considered while designing authentic learning. However, in practice, this might not be easy or possible to carry out. It is also worth noting that context plays an important role in shaping certain design and teaching practices. Therefore, continued research that provides detailed accounts of design practices of authentic learning in online courses in a variety of content areas will enrich the body of knowledge regarding instructional design theories for authentic learning, e.g., importance of factoring in learning contextual nuances and differences.

Investigating creative ways of designing and implementing authentic learning that present equitable, inclusive, and sustainable learning design solutions could provide further insights as to how such experiences can still be done in the case of emergent situations. Further, continued research on completely online authentic learning could enrich instructional design theories with additional approaches as to how to support authentic learning.

Implications for Practice

It is important to know that the tension between theory and practice exists. Concepts and terms might not be used the same way in practice as they are defined in theory. Therefore, it is crucial to understand and value one's background, experiences, and perspectives while working on the course design projects. Instructional design is a multi-step process involving many stakeholders (e.g., faculty, instructional designers, administrators, and students). Therefore, it is essential to have methods and tools that help navigate this multifaceted process. As the first step, it is important for key stakeholders to agree conceptually and tactically how to design and implement authentic learning. For instance, if interpretations of authentic learning vary greatly among faculty that results in inequitable learning experiences among students, it might call for the need to clearly operationalize authentic learning and strategies implementation at a school or a department level.

In the given case, the design process revolved around competencies that were to be met for accreditation purposes. Although such competencies defined what students were to master by the end of each course, during the design process faculty still needed to be creative and build intellectual ties between authenticity and personal meaningfulness in student learning. In case a course is not built on competencies, practitioners can use this study to get insights regarding the

design of authentic learning and to gain ideas for authentic learning for their content areas based on the examples provided. As emphasized by scholars (e.g., Lowell & Moore, 2020; Vo et al., 2018), more studies that provide examples of how authentic learning is designed and implemented in online courses are needed for both further research and practice. This study provides faculty interpretations of authentic learning, specifically in online courses, and the challenges associated with designing and integrating authentic learning in online courses, while presenting examples from online public courses in the public health context.

Study Limitations

This study is situated in the context of graduate public health courses; thus, it is limited in its scope. Depending on the context, authentic learning can take many forms, and it is crucial to investigate how authentic learning is designed and integrated in other content areas and contexts. Also, the sample in this study is small which does not allow drawing generalizable results. Additionally, we acknowledge social desirability bias as a limitation of this study, meaning that the study participants may have reported only success stories omitting information about any failures in the design or teaching process.

Conclusion

With the growth of online learning, efforts from both scholars and practitioners are made to make online learning experiences as meaningful as in face-to-face settings. Authentic learning has been regarded as one of the most effective pedagogical approaches for that purpose. However, due its elusive and multifaceted nature, the term *authentic learning* has multiple interpretations and meanings. While in theory it is clear that authentic learning should situate students in settings in which they would use their minds and skills in the same way they would in the real world, in practice it is not as straightforward. While in the given context, designing real-life projects that require students to apply knowledge can be seen as a given, it comes with certain caveats. Therefore, thorough consideration of a learning context, which also includes design judgments, teacher core beliefs, and learners is paramount when designing and implementing authentic learning.

Conflict of Interest
The authors declared no conflicts of interest.

Ethical approval
All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Informed consent
Informed consent was obtained from all individual participants included in the study.

References

Anstee, J. L., Harris, S. G., Pruitt, K. D., & Sugar, J. A. (2008). Service-learning projects in an undergraduate gerontology course: A six-stage model and application. *Educational Gerontology*, *34*(7), 595-609. https://doi.org/10.1080/03601270801949419

Anderson, O. S., McCabe, C. F., Chuisano, S. A., Wicoff, E., Grabowski, A., & Sadovnikova, A. (2020). Virtual experiential learning: A description of an internship framework that engages students to build public health competencies. *Pedagogy in Health Promotion*, https://doi.org/10.1177/2373379920977537

Baldwin, S. J. (2019). Assimilation in online course design. *American Journal of Distance Education*, *33*(3), 195-211. https://doi.org/10.1080/08923647.2019.1610304

Baldwin, S. J., Ching, Y. H., & Friesen, N. (2018). Online course design and development among college and university instructors: An analysis using grounded theory. http://dx.doi.org/10.24059/olj.v22i2.1212

Bonk, C. J. (2020). Pandemic ponderings, 30 years to today: synchronous signals, saviors, or survivors? *Distance Education*, *41*(4), 589-599. https://doi.org/10.1080/01587919.2020.1821610

Britt, M., Goon, D., & Timmerman, M. (2015). How to better engage online students with online strategies. *College Student Journal, 49*(3), 399-404.

Brown, J. S., Collins, A., & Duguid, P. (1989). Situated cognition and the culture of learning. *Educational researcher, 18*(1), 32-42. https://doi.org/10.3102/0013189X018001032

Choi, J. I., & Hannafin, M. (1995). Situated cognition and learning environments: Roles, structures, and implications for design. *Educational technology research and development, 43*(2), 53-69.

Council for Education for Public Health (2016). *D2 Guidelines.* https://media.ceph.org/documents/D2_guidance.pdf

Colak, A. (2018). *A multiple-case study examining faculty members' online course design and teaching experiences in distance education* (Publication No. 10793578). [Doctoral dissertation, University of South Florida]. ProQuest Dissertations Publishing.

Coombe, L., Severinsen, C., & Robinson, P. (2020). Practical competencies for public health education: a global analysis. *International Journal of Public Health, 65*(7), 1159-1167.

Correia, A. P., Yusop, F. D., Wilson, J. R., & Schwier, R. A. (2010). A Comparative Case Study of Approaches to Authentic Learning in Instructional Design at Two Universities. Online Submission.

Cranton, P., & Carusetta, E. (2004). Perspectives on authenticity in teaching. *Adult Education Quarterly*, *55*(1), 5-22. https://doi.org/10.1177/0741713604268894

Creswell, J. W., & Clark, V. L. P. (2018). *Designing and conducting mixed methods research*. Sage Publications.

Cribbs, K., Lynch, S., LaMonica, M., Amadi, C., & Joshi, A. (2020). Enhancing graduate practicum project development and selection at Schools of Public Health: A case study. *Pedagogy in Health Promotion, 6*(3), 196-202. https://doi.org/10.1177/2373379919842232

Deale, C. S., Elders, E. & Jacques, P. H. (2010). The Appalachian Growers' Fair: an authentic learning, community engagement, sustainable tourism project. *Journal of Teaching in Travel & Tourism, 10*(2) 143–162. https://doi.org/10.1080/15313221003792001

Ertmer, P. A., Ottenbreit-Leftwich, A. T., Sadik, O., Sendurur, E., & Sendurur, P. (2012). Teacher beliefs and technology integration practices: A critical relationship. Computers & education, 59(2), 423-435. https://doi.org/10.1016/j.compedu.2012.02.001

Gardner, P., & Alegre, R. (2019). "Just like us": Increasing awareness, prompting action and combating ageism through a critical intergenerational service learning project. *Educational Gerontology*, *45*(2), 146-158. https://doi.org/10.1080/03601277.2019.1584976

Caruth, G. D., & Caruth, D. L. (2013). Distance education in the United States: From correspondence courses to the Internet. *Turkish Online Journal of Distance Education, 14*(2).

Collis, C., Foth, M., & Schroeter, R. (2009). The Brisbane media map: Participatory design and authentic learning to link students and industry. *Learning Inquiry, 3*(3), 143-155. https://doi.org/10.1007/s11519-009-0046-8

Gakh, M. (2020). Demystifying public health policy through service-learning pedagogy. *Pedagogy in Health Promotion*, *6*(2), 128-136. https://doi.org/10.1177/2373379919829499

Ferry, B., Kervin, L., Puglisi, S., Cambourne, B., Turbill, J., Jonassen, D., & Hedberg, J. (2006). Online classroom simulation: Using a virtual classroom to support pre-service teacher thinking. In Herrington, A., Herrington, J. (Eds.) *Authentic learning environments in higher education* (pp. 135-161). IGI Global.

Finch, J. L., & Jefferson, R. N. (2013). Designing authentic learning tasks for online library instruction. *The Journal of Academic Librarianship, 39*(2), 181-188.

Fitzsimmons, J. (2006). Speaking snake: Authentic learning and the study of literature. In Herrington, A., Herrington, J. (Eds.) *Authentic learning environments in higher education* (pp. 162-171). IGI Global

Fraenkel, J. R., Wallen, N. E., & Hyun, H. H. (1993). *How to design and evaluate research in education* (Vol. 7). New York.

Fougt, S. S., Misfeldt, M., & Shaffer, D. W. (2019). Realistic Authenticity. *Journal of Interactive Learning Research, 30*(4), 477-504. https://www.learntechlib.org/primary/p/184664/

Herrington, J., & Oliver, R. (2000). An instructional design framework for authentic learning environments. *Educational technology research and development*, *48*(3), 23-48.

Herrington, J., Reeves, T.C. and Oliver, R. (2010) *A Guide to Authentic e-Learning.* Routledge.

Herrington, J., Reeves, T. C., & Oliver, R. (2014). Authentic learning environments. *Handbook of Research on Educational Communications and Technology*, 401-412.

Herrington, J., Reeves, T. C., Oliver, R., & Woo, Y. (2004). Designing authentic activities in web-based courses. *Journal of Computing in Higher Education, 16*(1), 3-29. https://doi.org/10.1007/BF02960280

Herrington, J., Oliver, R., & Reeves, T. C. (2003). Patterns of engagement in authentic online learning environments. *Australasian Journal of Educational Technology, 19*(1). https://doi.org/10.14742/ajet.1701

Herrington, J., Oliver, R., & Herrington, A. (2007). Authentic learning on the web: Guidelines for course design. In *Flexible learning in an information society* (pp. 26-35). IGI Global.

Hickey, D. T., Chartrand, G. T., & Andrews, C. D. (2020). Expansive framing as pragmatic theory for online and hybrid instructional design. *Educational Technology Research and Development*, 1-32. https://doi.org/10.1007/s11423-020-09759-4

Honebein, P. C. (1996). Seven goals for the design of constructivist learning environments. *Constructivist learning environments: Case studies in instructional design*, 11-24.

Hou, S. I. (2009). Service Learning+ New Master of Public Health Student= Challenges for the Professor. *International Journal of Teaching and Learning in Higher Education*, *20*(2), 292-297.

Houke, C. (2017). Designing and using projects with real world application in a MBA managerial accounting class: The case of the balanced scorecard. *Journal of Learning in Higher Education, 13*(2), 33-38.

Herrington, J., Reeves, T. C., & Oliver, R. (2014). Authentic learning environments. *Handbook of research on educational communications and technology*, 401-412.

Khan, A., Egbue, O., Palkie, B., & Madden, J. (2017). Active learning: Engaging students to maximize learning in an online course. *Electronic Journal of E-Learning, 15*(2), pp107-115.

Knobloch, N. A. (2003). Is experiential learning authentic? *Journal of Agricultural Education, 44*(4), 22-34.

Koenders, A. (2006). An authentic online learning environment in university introductory biology. In Herrington A., Herrington, J. (Eds.) *Authentic learning environments in higher education* (pp. 48-60). IGI Global.

Kreber, C., Klampfleitner, M., McCune, V., Bayne, S., & Knottenbelt, M. (2007). What do you mean by "authentic"? A comparative review of the literature on conceptions of authenticity in teaching. *Adult Education Quarterly*, *58*(1), 22-43. https://doi.org/10.1177/0741713607305939

Kumar, S., Martin, F., Budhrani, K., & Ritzhaupt, A. (2019). Award-winning faculty online teaching practices: Elements of award-winning courses. *Online Learning, 23*(4), 160-180.

Lai, P. K., Portolese, A., & Jacobson, M. J. (2017). Does sequence matter? Productive failure and designing online authentic learning for process engineering. *British Journal of Educational Technology*, *48*(6), 1217-1227. https://doi.org/10.1111/bjet.12492

Lachheb, A., & Boling, E. (2018). Design tools in practice: instructional designers report which tools they use and why. *Journal of Computing in Higher Education*, *30*(1), 34-54. https://doi.org/10.1007/s12528-017-9165-x

Ladyshewsky, R., & Ryan, J. (2006). Peer Coaching and Reflective Practice in Authentic Business Contexts: A Strategy to Enhance Competency in Post-Graduate Business Students. In Herrington, A., Herrington, J. (Eds.) *Authentic learning environments in higher education* (pp. 61-75). IGI Global.

Lehman, D. W., O'Connor, K., Kovacs, B., & Newman, G. E. (2019). Authenticity. *Academy of Management Annals*, *13*(1), 1-42. https://doi.org/10.5465/annals.2017.0047

Luo, T., Murray, A., & Crompton, H. (2017). Designing Authentic Learning Activities to Train Pre-Service Teachers About Teaching Online. *International Review of Research in Open and Distributed Learning*, *18*(7). https://doi.org/10.19173/irrodl.v18i7.303

Loucks, S., & Ozogul, G. (2020). Preparing business students for a distributed workforce and global business environment: Gaining virtual leadership skills in an authentic context. *TechTrends*, *64*(4), 655-665. https://doi.org/10.1007/s11528-020-00513-4

Lowell, V. L., & Moore, R. L. (2020). Developing practical knowledge and skills of online instructional design students through authentic learning and real-world activities. *TechTrends, 64,* 581-590. https://doi.org/10.1007/s11528-020-00518-z

Martin, F., Budhrani, K., Kumar, S., & Ritzhaupt, A. (2019). Award-winning faculty online teaching practices: Roles and competencies. *Online Learning, 23*(1), 184-205.

McGaghie, W. C., Sajid, A. W., Miller, G. E., Telder, T. V., Lipson, L., & World Health Organization. (1978). *Competency-based curriculum development in medical education: an introduction*. World Health Organization.

Meredith, G. R., Patchen, A. K., & Baker, A. Z. (2020). Community engaged teaching, research and practice: A catalyst for public health improvement. *Michigan Journal of Community Service Learning, 26*(1). https://doi.org/10.3998/mjcsloa.3239521.0026.106

Miner-Romanoff, K., McCombs, J., & Chongwony, L. (2017). Interactive and authentic e-learning tools for criminal justice education. *American Journal of Distance Education, 31*(4), 242-257. https://doi.org/10.1080/08923647.2017.1306771

Nelson, H. G., & Stolterman, E. (2014). *The design way: Intentional change in an unpredictable world*. MIT press.

Newmann, F. M., Marks, H. M., & Gamoran, A. (1996). Authentic pedagogy and student performance. *American Journal of Education*, *104*(4), 280-312.

Oroszi, T. (2020). Competency-based education. *Creative Education, 11*(11), 2467-2476.

Ozverir, I., Osam, U. V., & Herrington, J. (2017). Investigating the effects of authentic activities on foreign language learning: A design-based research approach. *Journal of Educational Technology & Society*, *20*(4), 261-274. https://www.jstor.org/stable/26229222

Paddison, B., & Mortimer, C. (2016). Authenticating the learning environment. *Journal of Teaching in Travel & Tourism, 16*(4), 331-350.

Parry, G., & Reynoldson, C. (2006). Creating an Authentic Learning Environment in Economics for MBA Studies. In Herrington, A., Herrington, J. (Eds.) *Authentic learning environments in higher education* (pp. 76-87). IGI Global.

Peng, J., Wang, M., & Sampson, D. (2017). Visualizing the complex process for deep learning with an authentic programming project. *Journal of Educational Technology & Society*, *20*(4), 275-287.

Pendergrast, C. (2020, December 1). Health is Political: Public Health Practitioners and Researchers Should be Trained Accordingly. https://surface.syr.edu/lerner/14/

Pfeiffer, J., Beschta, J., Hohl, S., Gloyd, S., Hagopian, A., & Wasserheit, J. (2013). Competency-based curricula to transform global health: redesign with the end in mind. *Academic Medicine, 88(1),* 131-136.

Roach, K., Tilley, E., & Mitchell, J. (2018). How authentic does authentic learning have to be? *Higher Education Pedagogies, 3*(1), 495-509. https://doi.org/10.1080/23752696.2018.1462099

Rhodes, D., Visker, J. D., Whitney, E. A., & Cox, C. (2020). Interprofessional education collaborative competencies and the public health professional. *Pedagogy in Health Promotion, 6*(4), 274-280.

Sadaf, A., & Kim, S. (2019). Examining the Impact of Online Case-Based Discussions on Students' Perceived Cognitive Presence, Learning and Satisfaction. *16th International Conference on Cognition and Exploratory Learning in Digital Age (CELDA 2019).* 10.33965/celda2019_201911C055

Saldaña, J. (2015). *The coding manual for qualitative researchers*. Thousand Oaks.

Shaffer, D. W., & Resnick, M. (1999). "Thick" authenticity: New media and authentic learning. *Journal of Interactive Learning Research*, *10*(2), 195-216.

Schumacher, A., & Reiners, C. S. (2013). Designing authentic learning environments in chemistry lessons: Paving the way in pre-service teacher education. *Science & Education, 22*(9), 2173-2191.

Smith, S. B., & Kennedy, S. (2020). Authentic teaching to promote active learning: Redesign of an online RN to BSN evidence-based practice nursing course. *Journal of Professional Nursing, 36(*2), 56-61. https://doi.org/10.1016/j.profnurs.2019.07.005

Smith, G. G., Passmore, D., & Faught, T. (2009). The challenges of online nursing education. *The Internet and Higher Education, 12*(2), 98-103.

Stefaniak, J. (2020). A Systems View of Supporting the Transfer of Learning through E-Service-Learning Experiences in Real-World Contexts. *TechTrends, 64*(4), 561-569. https://doi.org/10.1007/s11528-020-00487-3

Stefaniak, J., Reese, R. M., & McDonald, J. K. (2020). Design Considerations for Bridging the Gap Between Instructional Design Pedagogy and Practice. *The Journal of Applied Instructional Design, 9*(3).

Stoddard, J., Marcus, A., Squire, K., & Martin, J. (2015). Learning local immigration history in and out of the museum. *Museum and Society*, *13*(2), 123-141.

Tracey, M. W., & Boling, E. (2014). Preparing instructional designers: Traditional and emerging perspectives. In *Handbook of research on educational communications and technology* (pp. 653-660). Springer.

Trespalacios, J. (2017). Exploring small group analysis of instructional design cases in online learning environments. *Online Learning*. *21*(1). 189-200.

Vo, N., Brodsky, A., Wilks, M., Goodner, J., & Christopher, K. (2018). Infusing authentic learning into online courses: A case of online introduction to sociology. *Journal of Educational Multimedia and Hypermedia, 27*(3), 391-409.

Wald, N., & Harland, T. (2017). A framework for authenticity in designing a research-based curriculum. *Teaching in Higher Education*, *22*(7), 751-765. https://doi.org/10.1080/13562517.2017.1289509

Watson, F. F., Bishop, M. C., & Ferdinand-James, D. (2017). Instructional strategies to help online students learn: Feedback from online students. *TechTrends*, *61*(5), 420-427. https://doi.org/10.1007/s11528-017-0216-y

Woo, Y., Herrington, J., Agostinho, S. and Reeves, T.C. (2007) Implementing authentic tasks in web-based learning environments. Educause Quarterly, 30 (3). pp. 36-43.

Yamagata-Lynch, L. C., Do, J., Skutnik, A. L., Thompson, D. J., Stephens, A. F., & Tays, C. A. (2015). Design lessons about participatory self-directed online learning in a graduate-level instructional technology course. Open Learning: *The Journal of Open, Distance and e-Learning, 30*(2), 178-189. https://doi.org/10.1080/02680513.2015.1071244

Young, M.F. (1993). Instructional design for situated learning. *Educational Technology Research and Development*, *41*(1), 43–58. https://doi.org/10.1007/BF02297091

Making Sense of Crisis: Instructional Designers' Experiences with Emergency Remote Teaching

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Abstract

Following the transition to e-learning due to COVID-19, instructional designers (IDs) went into action to prepare faculty for distance education using new technologies and pedagogical approaches. The purpose of this qualitative study was to interpret how five members of an ID team at a U.S. higher education institution made sense of their experiences designing and implementing faculty-training courses to aid the emergency remote transition. Using sensemaking theory (Weick, 1988), this study explored their collective meaning-making process through collaborative multistep narrative and thematic analysis. The themes progressed on a storyline depicting their immediate action in response to the crisis, their felt emotions considering the challenges they encountered, their interpretations of collaboration and implementation, and their retrospective feelings of success. Implications of findings will contribute to continuity planning to inform future iterations of faculty-training courses as well as approaches to change and/or crisis impacting online instructional innovation within higher education.

Keywords: instructional design, faculty training, sensemaking, emergency remote teaching, online learning

Following the abrupt transition to e-learning in the spring of 2020 due to the COVID-19 pandemic, instructional designers (IDs) went into swift action to better prepare faculty for online instruction using new technologies and pedagogical approaches (Bao, 2020; Kilgore & Diaz, 2020). A growing body of research has since examined how faculty experienced the shift to Emergency Remote Teaching (ERT) (Bryne et al. 2021; Marek et al., 2021; Quezada et al., 2020; VanLeeuwen et al., 2021), but less attention has focused on the faculty trainers who pivoted to designing instructional online teacher training (but see Brereton, 2020; Xie, Gulinna, & Rice, 2021, and Xie, Gulinna, Rice, & Griswold, 2021). Building a rich description of the experiences of ID teams is imperative given the potential for future ERT, creating the need for ongoing online and hybrid teaching training.

Indeed, the flexible virtual learning environment has become part of our academic canvas. Continuing the dialogue on faculty training and ID during COVID-19 (Brereton, 2020; Hart et al., 2021; Rausch et al., 2022), this qualitative study explored the experiences of an ID team as they designed and delivered emergency online training courses to faculty at a U.S. higher education institution. Unlike previous research, however, this study illuminates the felt experiences of individual design team members and how they made sense of the collective process. Their perspectives will bring deeper understanding to the ID process as impacted by ERT and how this sensemaking can contribute to continuity planning both in times of crisis and for more efficient preparation in general.

Literature Review

Online learning has increasingly become part of our educational landscape since the mid-1980's (Harasim, 2000) and IDs have played an important role as change agents to help transition faculty both pedagogically and technologically (Campbell et al., 2009; Tracey et al., 2014; Halupa, 2019). Research on quality ID for online instruction has highlighted a scaffolded approach that includes orientation, mentoring, and continued support (Vaill & Testori, 2012) and being responsive to faculty (Northcote et al., 2015). In their comparative qualitative case study of two models for ID teacher training, Scoppio and Luyt (2017) found that individualized teacher training and support was ultimately one of the most important components for helping instructors transition to online instruction. However, the levels of support that instructors require involves an extensive commitment of time (i.e., two months) to assist in building the course, reviewing and approving the course before its official release, and providing continued collaboration and follow-up with instructors. The extensive time commitment necessary to prepare for online instruction is not a novel finding and has been commonly noted across the field (Mestan, 2019; Scoppio & Luyt, 2017; Vaill & Testori, 2012).

Collaboration amongst various stakeholders has also been highlighted as a top priority for IDs (Campbell et al., 2009; Miglani et al., 2018) especially since training faculty to teach differently can be a nuanced and delicate process. Magruder et al. (2019) conducted a mixed methods survey study with 139 IDs on how they define their roles based on what they do and found that collaboration with faculty was the top response. Drysdale (2021), however, found that collaboration may be impacted by the organizational structure of ID. They used a qualitative multi-case study approach to explore the experiences of IDs at three different higher education institutions with varying organizational structures and found that IDs who were in centralized teams with academic reporting lines felt more empowered and respected by faculty. IDs who were in administrative lines, however, had less collaboration with faculty, were often positioned as tech support, and felt more devalued for their pedagogical expertise.

Collaboration is also improved by establishing clarity of roles and expectations to avoid conflict and/or inefficiency (Mestan, 2019). Institutions should not limit online support and instruction to a single group and should instead build collaborative partnerships across university units for better efficiency in times of crisis (Bouchey et al., 2021). Halupa (2019) also stressed the importance of collaboration from the beginning between IDs and faculty to avoid conflict and also mitigate faculty resistance to online instruction. They suggested greater attention to role differentiation and associated areas of expertise in terms of faculty content knowledge and ID online pedagogy and design knowledge.

Emergency Remote Teaching

In a normal term, IDs support and train instructors to convey their content effectively through various online platforms (Kumar & Ritzhaupt, 2017); however, during an emergency situation the task of transitioning faculty to teach online is a more immediate and truncated process. Hodges et al. (2020) used the term emergency remote teaching (ERT) to describe "a temporary shift of instructional delivery to an alternate delivery mode due to crisis circumstances" (p. 6). While this specific term came as a result of the COVID-19 pandemic, ERT as a concept is not unique to the pandemic crisis.

Following the Hurricane Katrina disaster, for example, Hartman and DeMatteis (2008) examined the narrative experiences of business students at the University of New Orleans, along with the researcher's experience as an instructor during this time, in response to their unexpected switch to remote learning. Few had ever experienced working in the online format and their narratives highlighted that establishing structure in the time of crisis through the online courses was critical in their transition. Students also felt that instructors' ability to pivot to remote learning and be flexible with online instruction were a top factor of success in their online learning. Similarly, the New Zealand earthquakes between 2010 and 2012 forced many teachers to switch to online instruction. Wright and Wordsworth (2013) collected survey data from 1,746 college students to measure what students valued from teachers during this period. In line with the previous research, they found that maintaining learning structure during chaos was considered of high importance by students along with instructors' level of adaptability and flexibility with online teaching. These localized experiences consistently supported the need for increased ID preparation and training for online instruction.

Despite the lessons learned from previous crises, the widespread impact of the COVID-19 pandemic caught many institutions and stakeholders unprepared and forced instructors at all levels of education to immediately switch their classes to the online environment without preparation. Faculty reported increased stress and workloads during ERT (Bidwell et al., 2020; Johnson et al., 2020; Van Leeuwen et al., 2020) and Cameron-Standerford et al. (2020) found that faculty most frequently described their ERT experiences with the words: *challenging, concern, anxious, stressful*, and *relieved* (p. 5).

Not all faculty struggled with the transition to ERT, however, and earlier training predicted how easily and comfortably instructors transitioned their courses to the online environment during the initial months of the pandemic (Bryne et al., 2021; Jelińska & Paradowski, 2021). Worldwide survey studies from both Jelińska and Paradowski (2021) and Marek et al. (2021) found that instructors who had previous experience with remote teaching felt more prepared and were more engaged in ERT. Yet, in many cases, even faculty with previous online experience still were learning new technology or teaching methods (Johnson et al., 2020; Marek et al., 2021). Faculty felt that there should have had a "Plan B" ready for ERT since

learning various technologies and how to teach online "requires extensive planning" (Marek et al., 2021, p. 103).

Being prepared for crisis instruction also extends to the institutional level. In an interview study with 31 university chief online officers across the U.S., Bouchey et al. (2021) found that institutions that were already strong in online programming and collaboration across units before the pandemic were better able to pivot. However, the transition to ERT for less well-positioned institutions was much less efficient (Marek et al., 2021). With no end to the pandemic in sight, institutions moved into action to better prepare for the next instructional school year where all faculty would teach online. IDs were tasked to help faculty transition their courses to the online environment within a truncated period for preparation and execution (Johnson et al., 2020).

ERT ID Processes

Given the lack of time for substantial preparation (Marek et al., 2021), some literature related to ID has focused on the ERT methods and processes used by IDs (Rausch et al., 2022). Schrenk et al. (2021) reviewed the literature to determine best practices for online learning and Abramenka-Lachheb et al. (2021) documented their ID team's pedagogical approach to ERT with a step-by-step process to serve as a toolkit for other IDs during ERT. Labeling themselves as "first responders," Abramenka-Lachheb and colleagues presented a triage system strategy to provide faculty support based on faculty need (p. 295). One of the greatest faculty needs that IDs have responded to has been a lack of online teaching fluency as well as instructors' ritualized face-to-face practices, which have proved challenging to overcome (Gonzalez & Ozuna, 2021). Some IDs have looked to specific pedagogical models to aid them in responding to these barriers.

Brereton (2020) used principles of backward design during ERT to introduce Zoom as an online instructional platform. Brereton found that while the emergency training was insufficient for developing expert online instructors, it was successful in preparing faculty on a limited broad level based on the circumstances. Xie, Gulinna, Rice, and Griswold (2021) instead examined how a humanizing pedagogical lens could help IDs better support faculty particularly regarding "emotional presence, community, accessibility, modality, and performance" (p. 342). To build a supportive community with their students in the seemingly isolated world of virtual learning, the six IDs in Xie et al.'s study focused on increasing engagement through multimodal courses, increased course accessibility and inclusivity, and the incorporation of humanizing assessment.

ERT Experiences of IDs

While a few studies have mentioned the experiences of IDs, little research to date focuses specifically on the felt experiences of IDs and how they made sense of the ERT training process. Existing research does point to how IDs viewed their roles as crucial for faculty training and that they felt personally responsible for ERT preparedness (Abramenka-Lachheb et al., 2021; Brereton, 2020) even when they did not necessarily feel prepared themselves (Xie, Gulinna, & Rice, 2021). Although some IDs "lacked a feeling of certainty and confidence that this quick pivot to ERT would work" (Abramenka-Lachheb et al., 2021, p. 304), these same studies all reported feelings of success given the time constraints in post-ERT reflections. Additionally, Xie, Gulinna, and Rice (2021) also found that some IDs felt positive about the ERT training sessions because they perceived faculty to have increased "interest in asking for and accepting assistance" from IDs (p. 79) and they felt hopeful that they would see an increase in respect for their profession. One participant, for example, mentioned that before the pandemic, faculty saw

IDs as evaluators of their courses, but following ERT, faculty began to see them as helpful resources instead. Bidwell et al. (2020) added that the 130 faculty they surveyed also saw IDs as a supportive lifeline during ERT in helping them get through the process. They quoted one participant as saying, "[the IDs] have talked me down from the ledge on multiple occasions" and another as "I have [the IDs] on speed-dial!" (p. 68). While these comments were from faculty rather than the IDs themselves, they provide anecdotal evidence of the level of support that IDs engaged in to help their faculty through the crisis.

Research has highlighted that IDs were "invaluable" in helping with instructional continuity during the transition to ERT (Bidwell et al., 2020, p. 66), but their experiences as they engaged in the rapid overhaul to online instructional training are important for gaining a deeper understanding of ERT from the ID perspective. The perspective of IDs will be instrumental as we move forward with preparing for future emergencies. Grounded in a constructivist paradigm, we looked to sensemaking theory (Weick, 1995) as a frame to interpret how members of an ID team reflected on and made sense of their experiences designing and implementing faculty-training courses during the COVID-19 pandemic. This crisis-created experience provides a unique opportunity for sensemaking to occur (Maitlis & Sonenshein, 2010). By examining the experiences of the five individual members of the design team, this theoretical lens enabled us to find collective meaning in their sensemaking process to potentially inform future iterations of the faculty-training course as well as approaches to change and/or crisis impacting instructional innovation in higher education. The study was guided by the following research question:

How did an ID team make sense of their experiences during the design and delivery of a training course to support faculty in the abrupt transition to virtual instruction caused by COVID-19?

Theoretical Framework

Sensemaking theory provides clarity around how members of an organization retrospectively interpret and create meaning of shared experiences in times of change (Weick, 1988; Weick, 1995). Sensemaking is a collective process that initially occurs at the individual level, but then is further shaped by shared experiences and reflection. Scholars have used this theoretical lens in times of crisis to understand the social actions taken in immediate response to chaos and turbulent change (Christianson & Barton, 2020; Stephens et al. 2020; Stieglitz et al., 2018). Weick (1988) noted that particularly in times of crisis, action in response to the abrupt disruption of an organization's typical routine becomes the impetus for sensemaking following enactment. Maitlis and Sonenshein (2010) additionally highlighted the role of emotion in sensemaking in that it includes both felt and expressed emotions which may be perceived differently throughout the process of the change event as meaning is constructed socially.

Methods

This qualitative study looked specifically at the experiences of the five members of the ID team at a small university in the southeastern U.S. as they designed and implemented three one-week training courses during the summer of 2020 to prepare faculty for online instruction during the COVID-19 pandemic. We approached our inquiry using a Heideggerian phenomenological frame informed by sensemaking theory to understand the lived experiences of our participants during ERT. Our interpretations of the phenomenon drew upon the relational dimension of our own positionalities and roles in combination with a narrative thematic analysis to communicate "storied ways of knowing" (Riessman, 2005, p. 1).

Reflexivity

As qualitative researchers, we recognize that our positionality and subjectivity are part of how we approach research and construct meaning from data and we acknowledge that "we cannot separate ourselves from what we know" (Lincoln et al., 2011, p. 104). Each of the five researchers on this project had direct experience with conducting or participating in online training across two different higher education institutions during the COVID-19 pandemic. At her previous institution, Moreno worked with an ID team as a faculty trainer for ERT and Flood and Rausch both participated as faculty in ERT trainings. All three had taught in higher education for six to ten years. In their positions as IDs, Takahashi and Kluge provided an emic perspective to understand findings bringing a combined total of 22 years of ID experience.

Both our emic and etic experiences play an underlying role in this study, and we have been intentionally conscious of our subjectivity. Furthermore, the two methodologists on the research team (Moreno and Flood) came to the project from different institutions and while they were familiar with the general context of online ID in light of the pandemic, they were able to approach the study with outside perspectives. Throughout the study, they reflected on their own experiences as faculty and as a faculty trainer during ERT in triangulation with the collected data and construction of the narrative.

In addition to our reflexivity, we employed other qualitative strategies for trustworthiness including a clear description of our methodological process, collaborative peer review as we interpreted the data, intentionality with searching for and highlighting negative cases, and member checks with participants after the findings were written.

Participants

This study focused on the experiences of one ID team and therefore used convenience sampling to recruit the five team members. The team included three IDs who were primarily responsible for developing and leading the faculty training program along with two leadership members in academic affairs who oversaw the team efforts and contributed big picture decisions on topics such as content leveling, training duration, and mix ratio of course design and technology. While all five participants had extensive experience in different capacities in higher education (5, 17, 20, 31, and 33 years), as a team they were still relatively young. The two leaders had collaborated with the ID team for one and one and a half years, respectively, and one of the IDs had joined the group less than two years before. The other two IDs, however, had been in their roles for 17 and 20 years. Three participants identified as male and two as female, but to ensure anonymity in such a small team, we gave each participant a gender-neutral pseudonym: Taylor, Cameron, Tristan, Kris, and Casey.

Context

While there were established online programs within the university and a designated office of instructional innovation that included online teaching and learning, up until the pandemic, many of the faculty at this university had not taught online or engaged in online instruction training. The university therefore supported the need to train faculty during the summer of 2020 in preparation for continued online instruction in the fall of 2020. The ID team also partnered with the university's informational technology (IT) team to develop the summer training program. The two collaborating groups were responsible for implementing different units across the whole training series. The IT team conducted the first session unit in a synchronous format and the ID members were responsible for units two and three, which were

delivered asynchronously. Each unit had a different theme with unit one relating primarily to technology, unit two toward instruction with technology, and unit three on instructional strategies and pedagogy. Due to high faculty participation, each of these units were offered twice during the summer of 2020.

Data Collection and Analysis

This research study and associated protocols were approved by the university's Institutional Review Board. We developed an IRB-approved semi-structured interview protocol with 14 exploratory questions that focused on the design and implementation of the faculty training sessions and how the ID team members retrospectively made sense of their experiences. Rausch conducted the individual interviews with each of the five members of the ID team following the conclusion of the 2020 summer training sessions. The interviews were conducted virtually via the online Microsoft Teams platform and recorded for transcription purposes. The recordings were deleted following transcription. We also collected a six-page artifact written by the ID team that detailed an outline of the training process for ERT faculty development.

We analyzed the interview transcripts and artifact data using a collaborative multistep narrative and thematic process to understand the shared experiences of the individual participants through "common thematic elements across research participants and the events they report" (Riessman, 2005, p. 3). Riessman (2005) described this analytic typology as narrative analysis that is thematic in nature (p. 2). The narrative story is organized and communicated through illustrative themes and in doing so, thematic analysis contributes to the interpretation of the story. Braun and Clarke (2012) added, "Through focusing on meaning *across* a data set, [thematic analysis] allows the researcher to see and make sense of collective or shared meanings and experiences" (p. 57). Our narrative analytic process was strengthened by making meaning from our participants' collective experiences.

We first organized the data on NVivo software and then reviewed the transcripts together, talking through the developing story and writing memos throughout the process. One of our memos started with, "We are seeing this come together as more of a narrative of themes where we tell the story of how this process came together and played out" and we continued to memo the various plot sections of the interrelated data. In the second read-through, we coded the data guided by our research question. We inductively derived codes from the data using both an in vivo coding method as well as descriptive codes to tag the data. Following our multiple rounds of collaborative coding, we then grouped our codes into larger thematic categories noting negative examples across the categories. We created a code map to organize and label our themes and then returned to the transcripts for another read-through to recontextualize the themes along a narrative plotline. Our final stage of analysis overlapped with our writing process as we returned to our theoretical framework to make sense of our categories and develop our narrative of findings. Throughout our analysis we also reflected on our own experiences as part of understanding the overall phenomenon.

Findings

Guided by our research question and framed by sensemaking theory, we found that while the five participants had varying individual reflections, overall themes produced a collective narrative of their shared experiences, what they encountered and enacted, and how they interpreted the outcomes of the faculty training course. These themes progressed on a storyline depicting their immediate action in response to the crisis, their felt emotions in response to the

challenges they encountered, their interpretations of collaboration and implementation, and their retrospective feelings of success.

"You Better Have It Built When They Get There"

The team consistently described approaching the design of the training program as going into crisis mode and "mitigating the crisis," as Kris stated, for the faculty within a short period of time. Indeed, Tristan reflected on their initial approach as going into "a crisis mode that required some crisis-management thinking that was supportive of faculty, so it gave them a way forward." Yet, to do so was a demanding task for those involved. The team members used phrases like "horrific," "a terrible thing," and "the cards that were given to us" to explain their experiences. Taylor candidly described their initial realization of what they had to do as:

> We were all in this "oh shit, what are we going to do?! Situation" and that's when you're just like "here's what we're going to do, here's how we're going to do it"—just like, all hands-on deck, right? There's no point in complaining, it's just [how it is].

Tristan referred to the crisis as the "storm" the team had found themselves in and, like Taylor, juxtaposed it against the necessity that the work had to happen. Tristan could not fathom leaving the transition to online learning up to faculty to navigate alone:

> I could not live at peace without providing faculty with opportunities to find a way forward. To ask them to do that absent of sort of a unique, if not additional support, just seemed to be almost criminal. It was just unfair.

Despite the team's collective sense of duty in helping the faculty navigate the crisis, they found themselves slipping into survival mode as they became overwhelmed with the quick turnaround, compounding factors, and overall workload. Taylor voiced it as "a lot of the 'outside-of-our-control' factors and stress levels [crept] in and it just sort of turned into a survival thing." This perception of the consuming nature of the task was also mentioned by Kris and Casey who respectively referred to their experiences as "not sustainable" and that "we wished we had more help because it was—gosh—it was a lot." Kris further painted the picture of "the tremendous amount of work" the team found themselves doing:

> I was working 60–70-hour weeks all summer . . . The other people on the team . . . were working so hard all of the time and you know, so really, it was just getting it done. And the only way to get that amount of work done was to cut into your personal time in a significant way, at least for me. So that was probably the bumpiest part, you know, it had to be done. You tell people you're going to build it and they show up, you better have it built when they get there.

The limited time frame proved to be one of the team's greatest challenges, which was then heightened by contributing factors related to program design.

Design Obstacles

The team also experienced internal institutional obstacles that contributed to their collective sense of chaos and uncertainty. These issues included concerns with bandwidth, accessibility, IT security, and general infrastructure related to technology. Cameron provided a glimpse into some of the challenges:

> At the same time that our faculty had not actively engaged in online teaching, our institution's infrastructure was not set up to handle it. So, I needed to make sure that the Wi-Fi connection was significantly improved in all buildings because we anticipated not only the faculty would be using greater bandwidth but that students would be clustering

in those buildings to use it. So, significant upgrade in that. Secondly, we needed to make sure about accessibility and that we were meeting Federal Accessibility standards which meant that many, many more of those classes were going to have to be transcribed and the automated services that are used to transcribe these had to be enhanced so we had to make investments in additional hours to be able to have that transcription process go through. We also needed certain technologies to be approved . . . So, throughout a lot of different systems we had to go back and do additional reviews and augmentation so that technology would be ready and capable of handling the added load.

Despite these challenges, team members felt supported by the institution itself, which helped them move forward with their task. Kris stated, "the institutional infrastructure was very supportive. The provost was extremely supportive of the effort and was behind it in every way [and] the institution was financially supportive in incentivizing faculty to participate."

The team experienced other hurdles related to role clarity, implementation of processes, and issues related to communication and coordination. Taylor articulated that, at times, the program design was hindered by the lack of time to adequately develop a systematic approach:

I think there was a lot of like, "oh, well, I was going to do this," "well I did this already and . . .," "well, I thought we were doing this that way now," and "well, it's that way now" . . . What's important to me is to make sure everybody knows what the hell they need to do and by when, especially when there's . . . a crunch sort of thing going on? And then . . . follow through, you know! Like, don't make last minute changes, please? Or if you do, make sure they're communicated to all involved parties.

Casey attributed this to the "rush at the beginning to make decisions . . . without us having all the information that we could to make the best decision possible." Kris, on the other hand, had a more positive view of the constant state of flux the team found themselves in and understood it as necessary for improvement:

Everybody was working very hard and everybody wanted to get this right and because of that, things kept changing. People kept getting different ideas about how we could make it better if we just did it "this way" or, um . . . "oh, well, no, let's assess this way," so there was a lot of iterations and changes going on and so . . . things changed a lot and I think, you know, the changes that we experienced as the project unrolled, probably each one contributed to making it better. But things were constantly changing and in a state of flux.

Regardless of how team members viewed the continual changes as frustrating or simply necessary, they contributed to how the team experienced the design process as both unpredictable and chaotic.

"It Wasn't for Lack of Effort"

In line with their experiences designing the program, the team members continued to navigate issues with concordance, but this time across institutional teams. The team further faced challenges trying to keep up with the unexpected high level of faculty participation. Although there was some overlap in the design and delivery of the instructional units, the delivery phase elicited different perspectives from the team members as they articulated what they experienced.

Coordinating Across Institutional Teams

Having two teams responsible for managing different units sometimes created a lack of congruence given the limited time to collaborate. Casey explained:

I think we could have coordinated that effort a little bit better. But again, when you have different teams participating in that—especially the first time that we worked together to deliver such a big training—I mean we're going to have things that we can work out and improve. So, I think that's a good experience for us in coordinating with a different team, outside of [our office], to deliver this type of training.

Taylor agreed and added further insight that the circumstances of the crisis were at the core of their collaboration issues: "There was a huge gap and mismatch [between the session units] because we didn't coordinate with them very well and it wasn't for lack of effort but just circumstances."

Kris likewise noted, "It was kind of hard . . . because we didn't always know what IT was going to do," but then went on to further explain the nuances of delivering a program through two different institutional teams:

I think we collaborated and worked very well with IT, but . . . then there's the fact that the technology training is under IT and the instructional training is under Academic Affairs, and so that stuff really overlaps a lot and is separated structurally and that can be challenging. And I think everybody did a great job working together and we've continued to grow our relationships collaborating, but, you know, it would be easier if structurally we were more integrated. Or, maybe not structurally, but the processes and procedures that go along with the roles of IDs and [IT] were more fluid.

Cameron instead discussed the collaboration with a forward-thinking positive lens:

[We] actually forged a better relationship . . . so that we worked cooperatively and that cooperation in terms of ongoing training has continued throughout this semester. We have an ongoing series now that is offered at least 6–8 trainings on technology, additional trainings on tenure and promotion, additional trainings on research, so there is so much more faculty training going on now than we ever had.

Cameron felt their experiences paved the way for stronger collaboration across institutional units.

Responding to Faculty

In addition to the challenges (or successes) related to collaboration, the delivery of the training courses forced the team to serve as direct points-of-contact for the faculty members enrolled in the courses. Casey described the work related to responding to faculty questions and discussion boards: "We saw a lot of faculty [members] engaging and just asking great questions, coming up with great suggestions." However, the high volume of faculty interaction created challenges related to team member workload. Casey mused, "how do you go through 50 comments that were posted since the last time that [you] checked the boards, right?" to elucidate the deluge of work that resulted from faculty interaction within the training units. Kris shared that "At the end of the first day there were . . . 250 plus posts from faculty in the discussion board and I was just astonished." Kris continued:

Even though each session was short and focused just for a week, it was very challenging, those faculty who elected to participate in the discussion boards participated at a very high level. We were having hundreds of posts per day, especially in unit 2 and we would need to read all those posts to make sure there weren't any questions that they needed us to specifically respond to.

For the synchronous units, the amount of work that resulted from faculty engagement was similar. Tristan recalled that "there weren't enough people to respond to all the questions in real time."

The ID team also included faculty Q&A boards where they encouraged participants to leverage their own expertise to help each other, but the ID team still had to sift through the questions to make sure they were all answered. Even though the team members were "excited" to have faculty be so responsive to the training program and to each other, their team simply did not have enough staff to balance the level of engagement.

"Overall I Feel Satisfied"

Following the conclusion of the training modules, the design team members expressed general feelings of positivity regarding the delivery of the sessions, which came as a surprise to them given the constraints brought on by the crisis. Optimistic descriptive words such as "fulfilling," "pleased," and "very happy" were more prevalent in their discussions about the overall success and impact of the program. Casey and Kris both communicated a sense of achievement in better preparing faculty to teach online. Casey reflected, "And the fact that this training was helping so many faculty . . . this to me, was the most fulfilling part of this entire project." Casey also described how the team had been worried that the faculty would have been critical of their efforts but was happily surprised to learn that they instead found the trainings helpful.

> We were actually expecting more criticism, right? And we did not get a lot of that from faculty, which was, I guess a good surprise in the sense that, you know, faculty are telling us that it was good training. So, that was a really, really good surprise for us.

Kris explained that "the most important thing was to meet the faculty needs" and felt that this goal was accomplished by the way they laid out the training program for all skill levels with training on technology, course design, and how to teach online. Despite all the challenges presented by the pandemic, Kris concluded "overall I feel satisfied given the constraints we had."

Not all of the team, however, seemed to have the same concluding feeling of satisfaction. Taylor was more critical of the overall product, but felt it was a great starting point for continued development. Taylor stated:

> Was the program perfect? Heck no! Will it ever be? No. But we can make it better over time. I think that ultimately the final product was much better quality, [but] I tend to see the flaws . . . some of the synchronous sessions that were delivered were exceptionally well received and that was a highlight. So, if we could focus on "how did they do that?" and then "what can we replicate to make it better in the future?" [then] that's great!

Despite Taylor's more critical framing of the end result, Taylor still expressed a positive outlook toward future iterations of the program.

The faculty's level of engagement with the delivered content unexpectedly became an important marker of success for the design team. The team members reflected that they were "pleased" as Tristan noted with how much the faculty engaged with the courses particularly in the discussion boards. Kris articulated, "Faculty participated in [the discussion boards] at such a high level that it blew my mind . . . I was just astonished. I had never expected faculty to engage at that level and that was the most surprising thing." Casey added, "the number of faculty that engaged in the discussions, that to me, was . . . gosh, we were so excited." This created a feeling of accomplishment that on some level seemed to temper the challenges they had faced during the actual delivery of the sessions.

Contrasting Emotions as Sensemaking

Nevertheless, the participants vacillated in how they made sense of their experiences, oftentimes within the same breath. Indeed, Kris juxtaposed the positive and the negative in the same statement: "It was fine. It was a bit overwhelming." Kris continued, "It's not sustainable, it's not something I feel like we could do all the time, but it was fine for what we needed to do this summer." Casey also remarked on the simultaneous overlapping of contrasting emotions in reference to the overwhelming amount of work they had to do to stay on top of the faculty comments and questions. Casey stated, "that's something that was . . . a negative by-product, but at the same time positive because we had a lot of faculty [members] engaging." Taylor outwardly reflected on this negative versus positive contrast stating, "I'm trying to think of not just negative things but good stuff."

Taylor further commented on the temporal arc of their experience from extreme challenges to feeling surprised that it all came together: "I was surprised at how . . . this is from then till now, from that perspective. Things have improved a lot, from that perspective actually. It was kind of a horrific experience at the time." Casey echoed this feeling of having made the best of it:

> To me, it was really creating the best product possible, given the time frame that we had, right? We knew it was probably not going to be perfect, um . . . you know, but we really did our best to do the best training possible for faculty, given the timeframe that we had.

Despite the efforts involved in designing and implementing the training program, the team members came away feeling pleased with what they had accomplished.

Discussion and Implications

In response to our research question, the findings highlight the ID team's felt experiences along a narrative timeline as interpreted through sensemaking theory. Given that sensemaking is a process that happens in retrospect that involves individuals ordering, rationalizing, and symbolically assessing the preceding events (Weick, 2001), this research study opened up space for our participants to work through their experience in relation to ERT. Through our combined narrative and thematic analysis, we were able to further make sense of their individual perspectives as part of a collective story. That story highlighted creating order out of chaos, coming together despite disconnects related to infrastructure, sacrificing for the collective good, and, ultimately, completing a task that was once thought nearly impossible.

As other researchers have reported (Bao, 2020; Cameron-Standerford et al., 2020), the crisis created a survival-type of response that was immediate, on-the-fly, and overwhelming for the ID team. Yet, they made sense of their situation through a shared perception of a collective willingness to help faculty and students get through it. They knew the faculty and students needed the support, and that they were the ones who had the expertise to do it—a sentiment that was reported by other IDs during ERT (Abramenka-Lachheb et al., 2021; Xie, Gulinna, & Rice, 2021). This sense of duty required overcoming challenges and obstacles but resulted in the design and delivery of a product that helped to ameliorate faculty stress by improving the online delivery of courses. Like other IDs, one of the greatest challenges for this team was the truncated amount of time (Johnson et al., 2020). Given that best practices for quality design highlight having ample time (Marek et al., 2021; Scoppio & Luyt, 2017), it makes sense that this was a major issue for the team not only for wanting to develop a quality training, but also in terms of sheer stress for the rapid pivoting and looming deadlines. The unsustainable stress and workload

for the small team illuminates the reality of working in crisis mode and supports the need to prepare in advance for future emergencies.

Despite the challenges and working harder than they ever had "in their lives," they were happy with the result and were surprised at how positively the faculty reacted. As reported by other IDs (Brereton, 2020; Xie, Gulinna, & Rice, 2021), the participants in this study came away from their experience ultimately feeling positive that they met the needs of their faculty and they succeeded in engaging them in ID. Part of this positivity may have also been related to the elapsed time between the trainings and the interviews as was the case with Brereton (2020) who noted feeling less critical and more proud of their work after having some distance from the training. Additionally, the team felt supported by their institution, and they recognized that having institutional infrastructure during ERT was crucial, a point also emphasized by other scholars in the field (Miglani et al., 2018; Northcote et al., 2015; Xie, Gulinna, & Rice, 2021). Despite these positives, the process of implementing an ERT training program in such a truncated timespan was not sustainable for this ID team; we argue that by addressing certain elements now, the process could be made more tenable in future iterations.

Considering Roles and Collaboration in Preparing a Plan of Action

The ID team found confusion with role clarity amongst themselves to be detrimental to efficient design and implementation. While role clarity has been discussed in the literature, it has focused on role clarity between IDs and faculty (e.g., Halupa, 2019; Magruder, 2019), but not within ID teams themselves. This finding implicates the need for a strong plan of action that includes role delegation to help mitigate confusion during ERT. Teams should also be intentional in times of crisis by explicitly assigning roles and tasks prior to the design stage.

Another challenge seemed to be working with two teams from different fields, which scholars have noted is critical in creating a smooth experience (Miglani et al., 2018; Northcote et al., 2015). Whereas this collaboration might be considered positive and desired in other situations, it was a challenge when there was not enough time to coordinate together. The result was a lack of cohesiveness between the separately prepared units. Chief online officers in Bouchey et al. (2021) also argued the need for more collaboration across units for improved institutional efficiency during ERT: "isolating expertise in online operations among a single set of people was not good for institutional efficiency" (p. 37). Mestan (2019) confirmed that a lack of collaboration across units is an issue that should initially be addressed by the institution who can help develop more fluidity between units that tend to overlap, e.g., ID and instructional technology. In creating a plan of action, teams should also highlight potential crossover points with other units with the intention to initiate and build early collaboration and communication.

Thoughtful consideration as it relates to putting in appropriate structures to help alleviate these issues related to disconnected and/or decentralized units also recalls Drysdale's (2021) assertion that:

> Institutions that are restructuring or building new ID teams implement centralized structures with academic reporting lines for their teams. The benefits of both centralization and academic reporting lines are clear: better advocacy and empowerment, better alignment with the pedagogical work of both designers and faculty, and less role misperception for IDs. Structuring these teams toward empowerment and better definitions of their roles as pedagogy experts may help them sustain their leadership on the initiatives they led, to great effect, during the COVID-19 pandemic. (p. 73)

Considering roles both within an instructional team and across units can lead to more cohesive units and streamline processes. Furthermore, it is important to interrogate current structures and how they factor into enabling or preventing efficiency for ID teams.

Managing Responsiveness to Faculty

Strong faculty participation created conflicting emotions for the ID team. They were elated that so many faculty were engaged in the learning process and that they were able to help support the faculty in their transition to ERT. At the same time, they were overwhelmed in trying to respond to everyone particularly regarding answering questions and troubleshooting. While they were motivated to be responsive because they knew the faculty needed them (see also Bidwell et al., 2020), they found themselves working to the point of exhaustion to keep up. Brereton (2020) likewise struggled to be responsive enough to their trainees and felt they were not successful in doing so within the ERT context. However, some teams foresaw this and created a plan of action to manage the overwhelming need from faculty. Abramenka-Lachheb et al. (2021) understood that they would not be able to respond to everyone with the same attention and therefore had to create a triage strategy for being responsive first to those who needed it most.

Although the ID team in this study was ultimately able to respond to all the faculty, it caused the team members to work at all hours of the night logging 60 to 70 hours each week. Discussion boards played an important role in the exchange of information and troubleshooting, but it was too much to manage for the small team even when they had faculty share ideas in a collaborative discussion forum. We recommend that future IDs consider a co-construction model in faculty training, with more faculty empowerment as leaders within the training program. Faculty come to training programs with various levels of knowledge and experience (see Bryne et al., 2020; Marek et al., 2021) and IDs should involve faculty expertise in intentional ways. Future teams can outwardly remove the assumed hierarchy between instructor and student, by formally inviting all faculty participants to take on the dual role of expert and learner. In the case of this ID team, they still had to monitor the faculty collaborative discussion board, which continued to be time-consuming. IDs might consider creating teacher teams with faculty team leaders who would manage their team's discussion boards in addition to intentionally incorporating other strategies that will engage faculty as sources of knowledge. Using a co-constructionist model can build a stronger community as all the members become engaged in various ways to support each other. While this approach may conflict with Halupa's (2019) recommendation for role differentiation, we believe the ERT context creates the need for an "all hands on deck" design and would therefore benefit from a co-collaborative model where expertise from all stakeholders is leveraged. Such an approach aligns with Xie, Gulinna, Rice, & Griswold's (2021) call for a humanizing pedagogy within ID training during times of crisis.

Conclusion

Understanding how the ID team made sense of their experiences during ERT presents us with information to help guide future ID not only during emergencies, but also in more stable times to create a smoother process in general. As Maitlis and Soneshein (2010) explained, such sense-making evaluations during crisis "can have a powerful generative effect on organizations, enabling renewal, and energizing restorative action among their members" (p. 555). Knowing that a crisis-induced environment produces chaos, future program design would benefit from both a collaborative and systematic approach instituted outside of crisis. In the case of this

study's team, they have since commenced regular meetings with overlapping units to share ideas and work towards collaboration on faculty development projects. The institution has also formed a faculty development committee with ID, IT, and faculty development representatives to improve communication and continuity of professional development offerings and to identify faculty needs.

While there were several limitations to this study (e.g., one institution and ID team, a single interview design, and the non-iterative context itself caused by the sudden onset of the COVID-19 pandemic), the implications contribute to the emerging research on faculty training in the ERT context from a sensemaking perspective. As this study and others demonstrate (e.g., Bidwell, 2020; Xie, Gulinna, & Rice, 2021), IDs were crucial in helping faculty transition their courses during the ERT and should be considered part of the critical infrastructure of higher education institutions. Doing so may also help mitigate the stress experienced by this ID team. ID teams should advocate for, participate in, and even lead the planning for the next crisis. An instructional continuity plan should define roles of specific teams and their members during a crisis and include a process for how they should respond to different scenarios. Based on their experience during the COVID-19 pandemic, IDs can help their institutions formalize the process of moving all courses online when faculty and students cannot meet in person.

To be more prepared for the next crisis, our findings lead us to suggest that IDs should leverage the relationships they have cultivated with faculty, university administrators, and different units during ERT. They can also engage faculty as sources of knowledge in providing instructional assistance to peers for teaching in alternative modalities, such as encouraging faculty to facilitate submodules based on expertise and previous experience or lead small peer groups within the large training sessions. By bringing those different stakeholders together, IDs will be in a better position to not only develop a more comprehensive instructional continuity plan for their institutions but to also respond more efficiently and effectively to a future crisis.

Declarations

The author declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

The authors assert that approval was obtained from an ethics review board (IRB) at Augusta University, USA.

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References

Abramenka-Lachheb, V., Lachheb, A., de Siqueira, A. C., & Huber, L. (2021). Instructional designers as "first responders" helping faculty teach in the coronavirus crisis. *Journal of Teaching and Learning with Technology*, *10*(1), 294–305. https://scholarworks.iu.edu/journals/index.php/jotlt/article/view/31368

Bao, W. (2020). COVID-19 and online teaching in higher education: A case study of Peking University. *Human Behavior and Emerging Technologies*, *2*(2), 113–115. https://doi.org/10.1002/hbe2.191

Bidwell, L. M., Boyle, K., & Boyle, D. (2020). Pedagogy in a pandemic: Emergency remote teaching during COVID-19. *Virginia Social Science Journal*, *54*, 65–73.

Bouchey, B., Gratz, E., & Kurland, S. (2021). Remote student support during COVID-19: Perspectives of chief online officers in higher education. *Online Learning, 25*(1), 28–40. https://doi.org/10.24059/olj.v25i1.2481

Braun, V., & Clarke, V. (2012). Thematic analysis. In H. Cooper (Ed.), *APA handbook of research methods in psychology: Vol. 2. Research designs,* (pp. 57–71). American Psychological Association. https://doi.org/10.1037/13620-004

Brereton, P. (2020). Emergency remote training: Guiding and supporting teachers in preparation for emergency remote teaching. *Language Research Bulletin*, *35*. 1–13. https://lrb.info.icu.ac.jp/home/lrb-volume-35-2020-1

Bryne, V., Hogan, E., Dhingra, N., Anthony, M., & Gannon, C. (2021). An exploratory study of how novice instructors pivot to online assessments strategies. *Distance Education, 42*(2), 184–199, https://doi.org/10.1080/01587919.2021.1911624

Cameron-Standerford, A., Menard, K., Edge, C., Bergh, B., Shayter, A., Smith, K., & VandenAvond, L. (2020). The phenomenon of moving to online/distance delivery as a result of COVID-19: Exploring initial perceptions of higher education faculty at a rural Midwestern University. *Frontiers in Education*, *5*, 1–11. https://doi.org/10.3389/feduc.2020.583881

Christianson, M. K., & Barton, M. A. (2020). Sensemaking in the time of COVID-19. *Journal of Management Studies*. https://doi.org/10.1111/joms.12658

Drysdale, J. (2021). The story is in the structure: A multi-case study of Instructional designer teams. *Online Learning Journal*, *25*(3). http://dx.doi.org/10.24059/olj.v25i3.2877

Gonzalez. L. & Ozuna, C. S. (2021). Troublesome knowledge: Identifying barriers to innovate for breakthroughs in learning to teach online. *Online Learning, 25*(3), 81–96. https://doi.org/10.24059/olj.v25i3.2641

Harasim, L. (2000). Shift happens: Online education as a new paradigm in learning. *The Internet and Higher Education, 3*(1), 41–61.

Hart, C., Alonso, E., Xu, D. & Hill, M. (2021). COVID-19 and community college instructional responses. *Online Learning Journal*, *25*(1), 41–69. http://dx.doi.org/10.24059/olj.v25i1.2568

Hartman, S. J., & DeMatteis, M. J. (2008). An investigation of faculty and student experiences and the move to online learning following Hurricane Katrina. *Journal of Online Learning and Teaching*, *4*(1), 1–13.

Hodges, C. B., Moore, S., Lockee, B. B., Trust, T., & Bond, M. A. (2020). The difference between emergency remote teaching and online learning. *Educause Review*. https://er.educause.edu/articles/2020/3/the-difference-between-emergency-remote-teaching-and-online-learning

Jelińska, M., & Paradowski, M.B. (2021). Teachers' engagement in and coping with emergency remote instruction during COVID-19-induced school closures: A multinational contextual perspective. *Online Learning Journal, 25*(1), 303–328. https://doi.org/10.24059/olj.v25i1.2492

Johnson, N., Veletsianos, G., & Seaman, J. (2020). U.S. faculty and administrators' experiences and approaches in the early weeks of the COVID-19 pandemic. *Online Learning Journal*, *24*(2), 6–21. https://doi.org/10.24059/olj.v24i2.2285

Kilgore, W., & Diaz, V. (2020, August 3). Upskilling instructional designer talent: Preparing for quality online learning. *Educause Review*. https://er.educause.edu/blogs/2020/8/upskilling-instructional-design-talent-preparing-for-quality-online-learning

Kumar, S. & Ritzhaupt, A. (2017). What do instructional designers in higher education really do? *International Journal on E-Learning, 16*(4), 371–393. https://www.learntechlib.org/primary/p/150980/

Lincoln, Y. S., Lynham, S., & Guba, E. G. (2011). Paradigmatic controversies, contradictions, and emerging confluences, revisited. In N. K. Denzin & Y. S. Lincoln (Eds.), *The Sage handbook of qualitative research (4th ed.)*. (pp. 97–128). Sage.

Magruder, O., Arnold, D. A., Edwards, M., & Moore, S. (2019). What is an instructional designer? A survey study. *Online Learning Journal, 23*(3), 137–160. https://doi.org/10.24059/olj.v23i3.1546

Maitlis, S., & Sonenshein, S. (2010). Sensemaking in crisis and change: Inspiration and insights from Weick (1988). *Journal of Management Studies*, *47*(3), 551–580. https://doi.org/10.1111/j.1467-6486.2010.00908.x

Marek, M. W., Chew, C. S., & Wu, W. C. V. (2021). Teacher experiences in converting classes to distance learning in the COVID-19 pandemic. *International Journal of Distance Education Technologies (IJDET)*, *19*(1), 89–109. https://doi.org/10.4018/IJDET.20210101.oa3

Mestan, K. (2019). Create a fine blend: An examination of institutional transition to blended learning. *Australasian Journal of Educational Technology*, *35*(1). 70–84. https://doi.org/10.14742/ajet.3216

Miglani, A., Awadhiya, A. K., Singh, N., Gowthaman, K., & Kansal, G. (2018). Policy recommendations from employers for enhancing skills through ODL. *Turkish Online Journal of Distance Education*, *19*(4), 64–75. https://doi.org/10.17718/tojde.471653

Northcote, M., Gosselin, K. P., Reynaud, D., Kilgour, P., & Anderson, M. (2015). Navigating learning journeys of online teachers: Threshold concepts and self-efficacy. *Issues in Educational Research*, *25*(3), 319–344.

Quezada, R. L., Talbot, C., & Quezada-Parker, K. B. (2020). From bricks and mortar to remote teaching: A teacher education program's response to COVID-19. *Journal of Education for Teaching*, *46*(4), 472–483. https://doi.org/10.1080/02607476.2020.1801330

Rausch, M. A., Flood, L. D., Moreno, R., Kluge, S., & Takahashi, A. (2022). Emergency support for faculty: Adherence to best practices in designing, developing, and implementing virtual training during a pandemic. *Journal of University Teaching & Learning Practice, 19*(2), 27–42. https://doi.org/10.53761/1.19.2.3

Riessman, C. K. (2005) Narrative analysis. In N. Kelly, C. Horrocks, K. Milnes, B. Roberts & D. Robinson (Eds.), *Narrative, memory and everyday life* (pp. 1–7). University of Huddersfield.

Schrenk, N., Alves, K., Van Dam, D., & Schrenk, B. (2021). Reflecting on best practices for online learning in a post-COVID-19 world. *Online Learning, 25*(4), 486–504. https://doi.org/10.24059/olj.v25i4.2460

Scoppio, G., & Luyt, I. (2017). Mind the gap: Enabling online faculty and instructional designers in mapping new models for quality online courses. *Education and Information Technologies*, *22*(3), 725–746. https://doi.org/10.1007/s10639-015-9452-y

Stephens, K. K., Jahn, J. L., Fox, S., Charoensap-Kelly, P., Mitra, R., Sutton, J., ... & Meisenbach, R. J. (2020). Collective sensemaking around COVID-19: Experiences, concerns, and agendas for our rapidly changing organizational lives. *Management Communication Quarterly*, *34*(3), 426–457. https://doi.org/10.1177/0893318920934890

Stieglitz, S., Mirbabaie, M., & Milde, M. (2018). Social positions and collective sense-making in crisis communication. *International Journal of Human–Computer Interaction*, *34*(4), 328–355. https://doi.org/10.1080/10447318.2018.1427830

Vaill, A. L., & Testori, P. A. (2012). Orientation, mentoring and ongoing support: A three-tiered approach to online faculty development. *Journal of Asynchronous Learning Networks*, *16*(2), 111–119.

VanLeeuwen, C. A., Veletsianos, G., Johnson, N., & Belikov, O. (2021). Never-ending repetitiveness, sadness, loss, and "juggling with a blindfold on:" Lived experiences of Canadian college and university faculty members during the COVID-19 pandemic. *British Journal of Educational Technology*, *52*(4) https://doi.org/10.1111/bjet.13065

Weick, K. E. (1988). Enacted sensemaking in crisis situations. *Journal of Management Studies*, *25*(4), 305–317. https://doi.org/10.1111/j.1467-6486.1988.tb00039.x

Weick, K. E. (1995). *Sensemaking in organizations*. Sage.

Weick, K.E. (2001). *Making sense of the organization*. Blackwell Publishing.

Wright, S., & Wordsworth, R. (2013). Teaching through 10,000 earthquakes: Constructive practice for instructors in a post-disaster environment. *International Journal of Teaching and Learning in Higher Education*, *25*(2), 144–153. https://www.isetl.org/ijtlhe/ijtlhe-issue.php?v=25&n=2&y=2013

Xie, J., Gulinna, L. A., & Rice, M. (2021). Instructional designers' perceptions of their roles in Emergency Remote Teaching. *Distance Education, 42*(1), 70-87. https://doi.org/10.1080/01587919.2020.1869526

Xie, J., Gulinna, L. A., Rice, M., & Griswold, D. (2021). Instructional designers' shifting thinking about supporting teaching during and post-COVID-19. *Distance Education, 42*(3), 331-351. https://doi.org/10.1080/01587919.2021.1956305

College Students' Belonging and Loneliness in the Context of Remote Online Classes during the COVID-19 Pandemic

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Abstract
The COVID-19 pandemic has drastically affected how higher education operates, but relatively little is known about its effects on students enrolled in remote online classes. Across two data collection timepoints, we sought to examine college students' experiences, focusing particularly on their sense of belonging/loneliness, their course formats, and their experiences in the pandemic. Though some findings differed between data collected in fall 2020 and in spring 2021, we generally found that students' belonging/loneliness was linked with their class format, aspects of their virtual classes, social contact, and experiences in the pandemic. This research demonstrates the importance both of understanding students' experiences in general and of continuing to study students' experiences as we progress from one stage of the pandemic to the next.

Keywords: belonging, loneliness, online classes, COVID-19, college students

The COVID-19 pandemic has significantly disrupted higher education. In March 2020, many professors and students around the U.S. and the world were forced to switch to remote online teaching and learning with little time to prepare. By fall 2020, many universities were still operating classes remotely (Chronicle of Higher Education, 2020). Although faculty had more time over the summer to plan for their fall 2020 courses, aspects of both fall 2020 and spring 2021 remote online courses were still new to faculty and students alike, including whether courses were offered synchronously (with virtual meetings via videoconference) or asynchronously (with no virtual meetings). However, we know little about the impact of these types of online courses on students' sense of belonging and loneliness. In fact, although much research has begun investigating the effects of the ongoing COVID-19 pandemic, relatively little examines the context of college students' emotional and social experiences. In particular, the unique isolation brought on by the pandemic may have affected students' ability to form connections with their classmates and professors. Therefore, in a study conducted during fall 2020 and spring 2021 at a regional comprehensive public university in the Northeast United States, we aimed to examine college students' belonging and loneliness during remote online classes in the pandemic.

Literature Review

College Students' Belongingness and Loneliness

The need to belong is a powerful primary human motive, as identified by Baumeister and Leary (1995). This need fuels our drive to form and maintain close relationships with other people and helps explain why we form social bonds with others quickly and easily. We feel happy when we form new social bonds or when we bolster existing relationships, but when our need to belong is unfulfilled, we risk negative mental and physical health outcomes, including depression, loneliness, and worse immune functioning.

The need to belong significantly impacts college students' academic and mental health outcomes. Students who perceive acceptance from peers report greater belongingness to their academic institution (Freeman et al., 2007). Freeman and colleagues (2007) found student participation and peer classroom interaction were the most significant factors fostering students' sense of belonging, while other research identifies additional relevant factors such as college grades, social integration on campus, and participation in high-impact practices (Ribera et al., 2017). Students who perceive belongingness exhibit greater motivation and confidence that they can succeed academically (Freeman et al., 2007; Zumbrunn et al., 2014). Further, students who feel they belong in each course tend to have higher final grades in that course (Yust et al., 2021). Conversely, college students who experience threats to belongingness resulting from interpersonal stress or low social support face worse mental health outcomes (Hunt & Eisenberg, 2010).

Importantly, instructors play a role in students' sense of belonging. For example, tutors in online classes can facilitate students' sense of belonging through establishing trust, providing meaningful learning experiences, and encouraging reflection (Peacock & Cowan, 2019). Qualitative research shows that K–12 educators can foster belonging through demonstrating authentic care for their students (Miller, 2021). In fact, a recent meta-analysis found that teacher support was one of the strongest predictors of sense of belonging among students (Allen et al., 2018).

While students who perceive belongingness to their college community benefit psychologically from social and institutional support, students who experience threats to

belongingness may lack these protective factors. College students who lack social connections with peers do report more depressive symptoms and greater suicidal ideation (Ploskonka & Servaty-Seib, 2015). Suicidal ideation among college students correlates with decreased perceived belonging to the campus community (Van Orden et al., 2008). Interestingly, college students' sense of familial belonging significantly mitigates suicidal ideation, suggesting that college students benefit from the support of family members and are buffered from threats to their sense of college belonging (Ploskonka & Servaty-Seib, 2015). Thus, establishing a sense of belonging is important to college students' mental health and their academic pursuits.

Like lack of belonging, loneliness can be particularly detrimental to college students' success. Marangoni and Ickes (1989) define loneliness as subjective and aversive, typically resulting from relationship deficits. Importantly, a distinction must be made between loneliness and aloneness, as loneliness does not require physical aloneness and the number of relationships actively maintained is of little importance (McWhirter, 1990); however, Weiss (1984) found that loneliness is often a consequence of relationship disturbances. As humans are social creatures, prolonged feelings of loneliness can have severe implications. If unaddressed, loneliness can greatly impact physical health, mental health, and cognitive functioning (Hawkley & Cacioppo, 2010).

Loneliness is closely related to perceptions of social support. People who perceive high social support believe they are loved, thought highly of, and belong to a social network (Cobb, 1976), which protects them against life adversity (Lee & Goldstein, 2015). Loneliness is linked with dissatisfaction with social support (Jones & Moore, 1987). Even further, individuals with more social support report lower levels of loneliness, therefore increasing quality of life (Gan et al., 2020) whereas those with low social support are more likely to also experience low self-esteem and low quality of life (Kong & You, 2011). Similarly, Mellor and colleagues (2008) found a link between the need to belong and satisfaction with personal relationships, with low satisfaction around personal relationships predicting higher levels of loneliness.

Mental health issues and loneliness are not uncommon in college. Interestingly, research has found that young men are most vulnerable to feelings of loneliness (Barreto et al., 2020). Good social support from friends has been identified as a protective factor (Gierveld, 1998; Lee & Goldstein, 2016). For example, shy college students with high-quality friendships are less lonely than shy students with low-quality friendships (Shell & Absher, 2019). Further, Samuolis and Griffin (2014) found students struggling with their identities, specifically in the areas of friendship, long-term goals, and career choice, are particularly lonely. In fact, both loneliness and lack of belonging are associated with poorer self-rated mental health (Jones & Schreier, 2021).

Thus, both lack of belonging and loneliness are potential threats to college students' mental health and college success. Both are likely to be affected not only by disruptive events like the COVID-19 pandemic, but also by disruptions to their education like the shift to remote online learning. Because both belonging and loneliness are crucially linked with social support and relationships with others, examining the relationships formed within college classes is also critical.

Peer Relationships in Classroom Contexts

Past research on loneliness has focused more on romantic loneliness than family and social loneliness (Bernardon et al., 2011), which neglects the importance of peer relationships. However, recent work shows that friendship can be more important than family or romantic relationships, as support from friends has a larger effect on perceived stress and loneliness (Lee & Goldstein, 2015). These inconsistencies in the literature can be explained not only by time but

also focus. Young adults' social bonds with friends are particularly important, as being able to form and maintain good peer relationships has a positive long-term impact on loneliness and mental health (DiTommaso & Spinner, 1997; Schwartz-Mette et al., 2020).

However, peer relationships are not always a focus in college classrooms. This lack of interaction can be detrimental when it prevents students from creating social bonds. Students who have more opportunities to interact and share ideas with their classmates feel supported by their peers and feel a greater sense of belonging within the classroom and the university (Gosnell, 2019). Similarly, other research shows that students with stronger peer relationships feel more connected with their classmates (Sollitto et al., 2013). In fact, peer-to-peer interactions are crucial for increasing students' belongingness, which facilitates positive outcomes (Sandstrom & Rawn, 2015).

What, if anything, can be done about the lack of belonging experienced by some students in college? Consider the literature on underrepresented minority and first-generation students, who experience lower belongingness compared to White students who are not first-generation (Fink et al., 2020; Gopolan & Brady, 2019). Minor interventions, such as daily journaling about one's experience in the classroom, can mitigate some of that deficit (Borman et al., 2019; Walton & Cohen 2007). Additionally, interventions that focus on improving peer-to-peer engagement within the classroom enhance school belongingness and life satisfaction (Dunleavy & Burke, 2019).

Little research has examined the impact of classroom peer relationships on belongingness. This is further complicated by the lack of research on the differences in belonging when comparing asynchronous, synchronous, and in-person learning. The pandemic has forced the majority of students at all levels into an online environment that they did not sign up for and were likely not prepared for.

In-Person vs. Online Classes

Research examining the differences between in-person and online classes, typically focusing on retention and success, has been mixed. For example, students taking online courses earn only slightly lower grades than students taking in-person courses (Fisher et al., 2020). On the other hand, students taking online courses earn a higher percentage of "A" grades but are also less likely to complete the course, compared to students taking in-person courses (Atchley et al., 2013). However, meta-analyses tend to produce overall effects close to zero (e.g., Bernard et al., 2004), suggesting that this general link is likely moderated by a variety of factors.

One such factor that may be particularly important is the frequency and quality of social interactions. Education researchers and teachers have long known that student interactions with their professor, their classmates, and the course content all facilitate learning (Anderson & Garrison, 1998). However, students taking online classes often feel disconnected from their peers; thus, opportunities for interaction with classmates via discussion boards and connection with professors and teaching assistants via tutorials are particularly helpful (Farrell & Brunton, 2020; Swan, 2002). Further, Jaggars & Xu (2016) found that rather than course organization or use of learning technologies, only interpersonal interaction with the course instructor predicts students' grades in traditional asynchronous online courses.

Notably, most existing research on online courses focuses on the traditional fully asynchronous model. During COVID-19, many professors shifted to a synchronous online format involving virtual meetings with students over videoconferencing platforms. Some existing research does examine students' experiences in synchronous online classes. For

example, Skylar (2009) found that synchronous online classes can simulate in-person classes, and McBrien and colleagues (2009) found that synchronous virtual classes offer important opportunities for interactions with professors and classmates. Attending more synchronous virtual classes as well as watching more recorded synchronous classes predicts students' final grades in a synchronous online class (Nieuwoudt, 2020). Students appreciate seeing their professors virtually and tend to think that synchronous classes are engaging (Chen et al., 2020). Additionally, Wang and Wang (2020) found that pre-service science teachers who learned with either in-person interaction or synchronous online interaction outperformed others who had either asynchronous interaction or no interaction at all during their courses. Further, synchronous discussions tend to produce better academic and social outcomes for students than asynchronous discussions (Peterson et al., 2018).

Thus, there are likely important differences between the experiences of taking fully asynchronous online classes vs. synchronous remote classes during the pandemic. It seems likely that remote online classes, particularly fully asynchronous classes, do not offer as many opportunities for students to develop bonds with their classmates and professors as in-person classes; thus, students may feel disconnected from their peers, professors, and their college. Indeed, past research has found that interaction, engagement, support, and general sense of community are crucial for online students' belonging and success (Peacock et al., 2020; Rovai, 2002; Shea et al., 2005). However, no existing research assesses whether participating in synchronous courses improves students' sense of belonging and decreases their loneliness, let alone what the effects of remote class format are during a global pandemic.

The COVID-19 Pandemic

Research examining the mental, emotional, and social impacts of the pandemic, along with its health effects, is already well underway. Several studies have found links between the COVID-19 pandemic and various mental health effects. In response to the coronavirus lockdown, researchers noted increased loneliness, depression, anxiety, and substance abuse (Labrague et al., 2021; Lee et al., 2020; Horigian et al., 2020). Loneliness has links to other mental health consequences of COVID-19 as well; for example, Arslan and colleagues (2020) found that anxiety about the coronavirus was correlated with loneliness. In a similar study, researchers found a link between greater coronavirus anxiety and lower college belongingness (Arslan et al., 2021). Overall, compared to 2018, the prevalence of mental distress among adults in the United States increased in 2020 (Twenge & Joiner, 2020).

Although the pandemic has affected all people across the world, it has had a particular impact on college students. Most of the changes that college students have reported experiencing are unfavorable (Lukács, 2021). For example, students have reported a lack of companionship, loneliness, and isolation as factors in their current causes of distress during the pandemic (Tasso et al., 2021). We have seen that relationships are critical to college students; in fact, college students have felt more worried and stressed over how COVID-19 would impact the health of their families and American society, compared to worry for themselves (Cohen et al., 2020).

The effects of the pandemic on college students stretch into classroom settings. Students have reported mental health issues and academic frustrations during COVID-19, including increased stress from the switch to remote learning and increased workload (Tasso et al., 2021). The intent of introducing remote learning was to mitigate the negative consequences of missing school. However, students whose classes transitioned online during spring 2020 reported decreases in course quality, including their enjoyment, interest, learning, attention, and effort in

those courses (Garris & Fleck, 2020). Despite this, some college students believe emergency remote learning due to COVID-19 has certain advantages over a regular classroom format, yet there are many areas in which they feel it can improve (Shim & Lee, 2020). There is much room for empirical investigations of remote online learning in the pandemic.

The Current Research

The purpose of the current research was to assess college students' experiences of belonging and loneliness in remote online classes during the COVID-19 pandemic. We were particularly interested in whether students' feelings of belongingness, loneliness, and connection with classmates and professors differed between students taking mostly synchronous classes and those taking mostly asynchronous classes, as well as what other variables may have impacted students' belonging and loneliness. We collected data to assess these questions during the fall 2020 semester and the spring 2021 semester.

Importantly, both semesters at the authors' and participants' institution consisted of majority remote online classes, where faculty made their own decisions about whether to offer courses synchronously vs. asynchronously. Students at this institution registered for fall 2020 courses during spring 2020, when all courses were listed with meeting times; two months before fall 2020 began, faculty were informed that classes would be offered remotely and allowed to decide in what format to offer their courses. Because students did not know until the beginning of the semester what format their courses would be offered in, they had little opportunity to choose their preferred format. In contrast, all spring 2021 courses were listed as either synchronous or asynchronous according to professors' preferences at the time when students registered; thus, students had more choice in their ability to select preferred learning formats during spring 2021. Therefore, by comparing data from both semesters with each other, we were able to test whether our findings still hold when students are in more control of what course formats they register for.

Method

Participants

We recruited participants for this study via the university's PSYC 100 participant pool through SONA during the fall 2020 and spring 2021 semesters.

Fall 2020 Sample

After deleting 14 duplicate responses and 11 incomplete responses from the data, the final sample size for fall 2020 was 160 participants. Our participants mostly identified as female (64%), with 35% identifying as male and 1% not disclosing their gender identities. The ages of our participants ranged from 18 to 36 (M_{age} = 19.67, SD = 2.18). The majority of our participants identified as Caucasian/White (78%), with 10% identifying as multiracial, 6% identifying as African American/Black, 2.5% identifying as Hispanic/Latino, 2% identifying as Asian/Asian American, and 1% self-identifying as Middle Eastern.

Spring 2021 Sample

After deleting 1 duplicate response and 1 incomplete response, the final sample size for spring 2021 was 188 participants. Our participants mostly identified as female (59%), with 40% identifying as male, 0.5% (1 person) identifying as non-binary and 0.5% (1 person) identifying as genderqueer. The ages of our participants ranged from 18 to 58 (M_{age} = 20.56, SD = 5.04). The majority of our participants identified as Caucasian/White (70%), with 14% identifying as African American/Black, 8% identifying as multiracial, 6% identifying as Hispanic/Latino, and 2% identifying as Asian/Asian American.

Materials & Procedure

This study was reviewed and approved by the IRB before data collection. Participants first completed a digital informed consent form and then began the study, which included questions about students' academic backgrounds (current year in school, transfer student status, first-generation vs. continuing-generation student status), current work and family responsibilities (including living situation and time spent with family and friends), perceptions of online classes (including previous experience with online courses and general liking of online courses), characteristics of their current classes (synchronous vs. asynchronous vs. in-person format, involvement in experiential courses, frequency of student-professor interactions, frequency of student-student interactions), and plans for registration for the following semester (intention to register in more synchronous classes vs. more asynchronous classes). In the spring 2021 data collection, we also included measures of participants' experiences in their fall 2020 classes, mismatch in preferred course format (i.e., whether their remote synchronous vs. asynchronous classes this semester matched their preferred course content), and preference for online classes post-pandemic. For descriptive statistics of these collected variables, see the Supplemental Materials. Participants next completed measures of sense of belongingness, loneliness, and reactions to the COVID-19 pandemic. Lastly, participants completed demographic questions. At the end of all survey questions, participants were debriefed and thanked for their participation in the study.

Sense of Belongingness

We measured participants' belonging at the institution with the Student Belongingness, Engagement, and Self-Confidence Survey (Yorke, 2016). This scale contains 16 items, each on a 5-point scale from 1 ("*strongly disagree*") to 5 ("*strongly agree*"). We revised some items to specifically name the current institution and some wording to reflect typical American English language (e.g., changing "programme" to "classes"); however, we did not need to modify the scale to reflect online learning as the items are more general in nature rather than tied to in-person learning (see example items below). The scale contains three subscales: student engagement (6 items, sample item: "I am motivated towards my studies", $\alpha_{Fall2020} = .77$, $\alpha_{Spring2021} = .77$); sense of belongingness (6 items, sample item: "I feel at home at [university name]", $\alpha_{Fall2020} = .73$, $\alpha_{Spring2021} = .80$); and self-confidence in academic pursuits (4 items, sample item: "I'm confident of completing my classes successfully", $\alpha_{Fall2020} = .63$, $\alpha_{Spring2021} = .71$).

Loneliness

We measured participants' feelings of loneliness with the UCLA Loneliness Scale (Russell et al., 1978); although originally developed many decades ago, this is still a commonly used scale to assess loneliness. This scale consists of 20 items, each on a 4-point scale from 1 ("*I never feel this way*") to 4 ("*I often feel this way*"). Example items are "I feel isolated from others" and "I am unhappy doing so many things alone". We summed all 20 items to create a loneliness score ($\alpha_{Fall2020} = .97$, $\alpha_{Spring2021} = .96$).

COVID-19 Experiences

We included 9 items from a longer questionnaire developed by Conway and colleagues (2020) to measure participants' general experiences in the COVID-19 pandemic, nonspecific to college or online learning. These nine items assessed negative financial impact, job-related

income loss, difficulty acquiring resources, difficulty getting necessities, depression due to COVID-19, negative impact on mental health, feeling threatened, fear of the virus, and stress around other people, all rated on a scale from 1 ("*strongly disagree*") to 5 ("*strongly agree*"). Because we selectively chose items from the full scale, we assessed items separately rather than creating a sum score.

Results

Belonging, Loneliness, and Remote Class Format

Table 1 presents the correlations between the belonging, loneliness, and class format variables of interest. Note that correlations for the fall 2020 data collection are reported above the diagonal, whereas correlations for the spring 2021 data collection are reported below the diagonal.

Table 1
Correlations Between Belonging, Loneliness, and Class Format

	1	2	3	4	5	6	7	8	9	10
1. Belonging		.56**	.38**	-.48**	-.20*	.03	-.16*	.21**	.09	-.03
2. Engagement	.53**		.43**	-.39**	.15+	.09	-.07	.20*	.08	.02
3. Self-Confidence	.29**	.48**		-.33*	-.19*	.02	-.001	.33**	.11	-.05
4. Loneliness	-.27**	-.10	-.33*		.17*	-.04	-.06	-.12	-.06	-.02
5. More sync classes	.02	.10	.02	-.09		-.22*	.03	-.15+	-.33**	.34**
6. More async classes	-.13+	-.08	-.03	-.09	-.002		.03	.03	.07	-.13
7. Previous online classes	.05	.22**	.24**	-.01	-.14+	.05		.05	-.04	-.01
8. Liking online classes	.16*	.43**	.38**	-.12+	-.04	-.02	.20**		.43**	-.31**
9. Plan to register more async	-.05	.04	.10	-.08	-.30**	.08	.06	.33**		-.79**
10. Plan to register more sync	.13+	.08	-.10	.07	.33**	-.18*	-.05	-.18*	-.67**	
11. Post-COVID online async	-.08	.13+	.25**	-.08	-.25**	.03	.14*	.57**	.53**	-.45**

Note. Number 11 was measured only in spring 2021. **$p \leq .01$; *$p \leq .05$; +$p \leq .10$

Contrary to our predictions, belonging was negatively correlated with taking more synchronous classes in fall 2020 but unrelated in spring 2021, and belonging was unrelated to taking more asynchronous classes in fall 2020 but marginally negatively correlated in spring 2021. Taking more synchronous classes was also positively correlated with loneliness, negatively correlated with self-confidence, and marginally negatively correlated with engagement in fall 2020, but unrelated to all these variables in spring 2021. This difference

between semesters likely implies that either students' ability to choose their course formats and/or their experience with remote learning are particularly important.

We added an item in spring 2021 designed to assess students' sense of match or mismatch about their current course formats and what they would have preferred. We used independent samples *t*-tests to assess whether match/mismatch mattered for belonging, engagement, self-confidence, or loneliness; no tests were significant (for all $p > .17$). This variable likely would have mattered more in the previous semester when students were not able to choose their course formats.

Work and Family Commitments

Working more hours was not correlated with engagement, self-confidence, loneliness, taking more synchronous or asynchronous classes, previous experience with online classes, or liking of online classes in either data collection timepoint (for all $p > .12$). However, working more hours was correlated with planning to register for more asynchronous classes the next semester in both the fall 2020 data ($r = .17$, $p = .04$) and the spring 2021 data ($r = .15$, $p = .04$), planning to register for fewer synchronous classes the next semester in both the fall 2020 data ($r = -.16$, $p = .05$) and the spring 2021 data ($r = -.24$, $p = .001$), and positively correlated with wanting to take more asynchronous classes post-COVID in the spring 2021 data ($r = .15$, $p = .04$). Further, although working more hours was not correlated with belonging in the fall 2020 data, these variables were marginally negatively correlated in the spring 2021 data ($r = -.13$, $p = .07$).

Spending more time on family obligations was also not correlated with belonging, self-confidence, taking more synchronous classes, previous experience with online classes, or plans to register for more synchronous or asynchronous classes the following semester in either data collection timepoint (for all $p > .27$). However, although uncorrelated in the spring 2021 data, increased family obligations were positively correlated in the fall 2020 data with engagement ($r = .22$, $p = .01$), marginally less loneliness ($r = -.16$, $p = .053$), and marginally more current asynchronous classes ($r = .15$, $p = .06$). Although uncorrelated in the fall 2020 data, increased family obligations were marginally negatively correlated with liking of online classes in the spring 2021 data ($r = -.13$, $p = .09$).

First-Generation, Transfer, and First-Semester Students

There was no difference in belonging between first-generation and continuing-generation students in either the fall 2020 data, $t(157) = -.62$, $p = .54$, or the spring 2021 data, $t(184) = .54$, $p = .59$. Interestingly, in the fall 2020 data, transfer students felt marginally more belonging at the university ($M = 22.83$, $SD = 3.79$) than non-transfer students ($M = 21.37$, $SD = 3.78$), $t(157) = 1.88$, $p = .06$, 95% CI [-.07, 2.99], $d = .39$; this finding was not replicated in the spring 2021 data, $t(186) = -1.45$, $p = .15$. Furthermore, there was no difference in belonging when comparing students who were in their first semester at the university, had begun the semester previously during the shift to online learning, or who had been at the university longer than that, in either the fall 2020 data, $F(2, 156) = .32$, $p = .72$, or the spring 2021 data, $F(2, 185) = .28$, $p = .76$.

There was also no difference in loneliness between first-generation and continuing-generation students in the either the fall 2020 data, $t(155) = -.22$, $p = .83$, or the spring 2021 data, $t(182) = .22$, $p = .82$. In spring 2021, transfer students did feel more lonely ($M = 45.91$, $SD = 16.09$) than non-transfer students ($M = 40.10$, $SD = 14.74$), $t(184) = 2.07$, $p = .04$, 95% CI [.26, 11.37], $d = .39$, but there was no difference in fall 2020, $t(155) = -.56$, $p = .57$. There was again

no difference in loneliness when comparing students who were in their first semester at the university, had begun the semester previously during the shift to online learning, or who had been at the university longer than that, in either fall 2020, $F(2, 154) = .44$, $p = .64$, or spring 2021, $F(2, 183) = .09$, $p = .92$.

Social Contact and Living Situation

We measured variables related to social contact and living situation only in spring 2021. Living situation did significantly impact belonging, $F(4, 183) = 3.13$, $p = .01$, $\eta^2 = .07$. Specifically, students living with their partner/significant other ($M = 15.33$, $SD = 8.02$) felt significantly less belonging than students living with one or more roommates ($M = 23.00$, $SD = 4.39$) or students who chose the "other" option (e.g., living with a friend's family; $M = 25.11$, $SD = 3.14$), and felt marginally less belonging than students living with their family ($M = 22.03$, $SD = 4.46$). However, these findings should be interpreted very cautiously due to the extremely low sample size of participants who reported living with their partner/significant other ($n = 3$). Notably, living situation did not impact loneliness, $F(4, 181) = .21$, $p = .31$.

People who reported spending less time with family than before the pandemic also reported lower self-confidence ($r = -.15$, $p = .04$), more loneliness ($r = .29$, $p < .001$), taking marginally more synchronous classes ($r = -.14$, $p = .06$), working more hours ($r = .17$, $p = .02$), and spending less time with friends than before the pandemic ($r = .56$, $p < .001$).

People who reported spending less time friends than before the pandemic also reported more loneliness ($r = .39$, $p < .001$), taking fewer asynchronous courses ($r = -.20$, $p = .007$) and more synchronous courses ($r = .18$, $p = .01$), planning to take marginally fewer asynchronous courses the following semester ($r = -.14$, $p = .06$), and working more hours ($r = .16$, $p = .03$).

Experiences in the COVID-19 Pandemic

Correlations between the nine COVID experiences items and our measures of belonging and loneliness are presented in Table 2.

Table 2

Correlations Between Belonging, Loneliness, and COVID-19 Experiences

COVID-19 experiences items	Belonging F20	Belonging S21	Engagement F20	Engagement S21	Self-Confidence F20	Self-Confidence S21	Loneliness F20	Loneliness S21
1. The Coronavirus (COVID-19) has impacted me negatively from a financial point of view.	-.24**	-.10	-.14+	.00	-.33**	-.17*	.43**	.26**
2. I have lost job-related income due to COVID-19.	-.12	-.08	-.03	-.01	-.18*	-.15*	.14+	.20**
3. I have had a hard time getting needed resources (food, toilet paper) due to COVID-19.	-.25**	-.16**	-.11	-.04	-.20*	-.20**	.26**	.23**
4. It has been difficult for me to get the things I need due to COVID-19.	-.26**	-.14*	-.19*	-.08	-.33**	-.17*	.16*	.24*
5. I have become depressed because of COVID-19.	-.31**	-.12+	-.34**	-.03	-.32**	-.33**	.59**	.59**

6. The COVID-19 outbreak has impacted my psychological health negatively.	-.21**	-.19*	-.29**	-.02	-.27**	-.28**	.56**	.57**
7. Thinking about COVID-19 makes me feel threatened.	-.25**	-.19**	-.09	.02	-.26**	-.28**	.40**	.42**
8. I am afraid of COVID-19.	-.09	-.001	.06	.21**	-.17*	-.09	.18*	.29*
9. I am stressed around other people because I worry I'll catch COVID-19.	.08	.01	.14+	.17*	-.16*	-.03	.21*	.23*

Note. **$p \leq .01$; *$p \leq .05$; +$p \leq .10$

As expected, students who reported being more negatively affected by the COVID-19 pandemic in a variety of ways also generally experienced lower belongingness, engagement, and self-confidence, as well as more loneliness. Particularly notable are the strong correlations between items 5 and 6 with loneliness, indicating that increased loneliness is linked with increased effects of the pandemic on mental health.

Intriguingly, additional analyses revealed that in the fall 2020 data collection, the sixth COVID item ("The COVID-19 outbreak has impacted my psychological health negatively") was also positively correlated with taking more synchronous classes ($r = .22$, $p = .007$), but uncorrelated with taking more asynchronous classes ($r = -.06$, $p = .44$), much like belongingness. Although we cannot determine causality from this correlational data, it is possible that the students taking synchronous classes felt particularly isolated and negatively affected by the pandemic because synchronous classes are so different from traditional in-person classes; in other words, perhaps the surprising link between taking more synchronous classes and feeling less belonging and more loneliness in fall 2020 is explained by COVID distress.

To test this post-hoc hypothesis, we first ran partial correlations between taking more synchronous classes and both loneliness and belonging, controlling for the sixth COVID item. The partial correlation for loneliness disappeared ($pr = .06$, $p = .46$), indicating that the bivariate correlation between taking more synchronous classes and loneliness only exists because COVID distress is correlated with both. However, the partial correlation for belonging was weakened but remained marginally significant ($pr = -.16$, $p = .051$), indicating that this bivariate correlation is not fully eliminated by controlling for COVID distress.

However, perhaps COVID distress helps explain why the correlation between taking more synchronous classes and belongingness exists. We ran a mediation model to test this possibility using PROCESS (Hayes, 2012) and bootstrapping methods with 5,000 resamples (Preacher & Hayes, 2008). Our results showed that the tendency for people taking more synchronous classes to feel less belonging was statistically mediated by their higher pandemic-related mental health distress, indirect effect $b = -.11$, BootSE = .07, 95% BootCI [-.2776, -.0020].

Figure 1

COVID Distress Mediates the Link Between Taking More Synchronous Classes and Lower Belongingness

COVID Distress

$b = .19$, BootSE = .07, $t(156) = 2.76$, $p = .007$

$b = -.56$, BootSE = .25, $t(155) = -2.24$, $p = .03$

Number of synchronous classes

Belongingness

Direct Effect, $b = -.44$, BootSE = .22, $t(155) = -1.97$, $p = .05$

Indirect Effect, $b = -.11$, BootSE = .07, 95% BootCI [-.2776, -.0020]
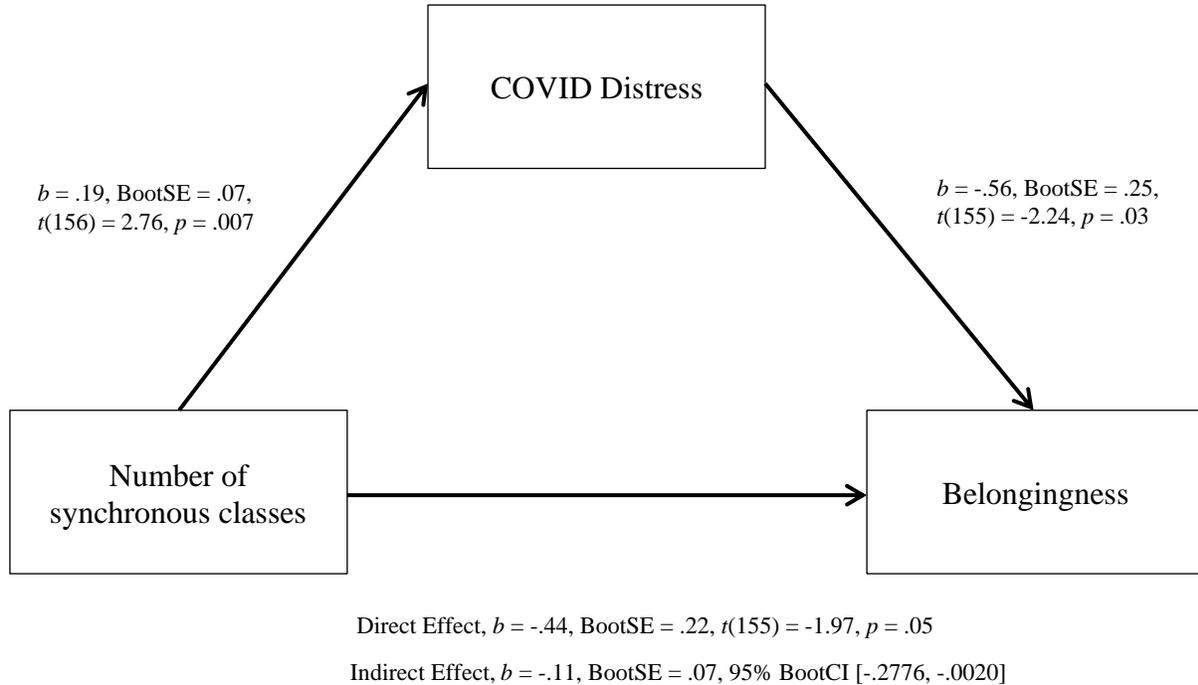
Importantly, we could not replicate these post-hoc analyses using the spring 2021 data, as belongingness was not correlated with taking more synchronous classes at that timepoint. Thus, although these findings are intriguing, they seem to be limited to fall 2020 alone.

Experiences in Remote Online Classes

We included several items regarding students' experiences in their remote online classes in spring 2021 that were not measured in fall 2020. Correlations between belonging, engagement, self-confidence, loneliness, and all 15 of our self-created experiences in online classes items are shown in Table 3.

Table 3

Correlations Between Belonging, Loneliness, and Experiences in Online Classes

Experiences in online classes items	Belonging	Engagement	Self-Confidence	Loneliness
1. In virtual class meetings, I have my camera on most of the time.	.28**	.24*	.15*	-.11
2. In virtual class meetings, other students have their cameras on most of the time.	.18*	.03	.03	-.08
3. I participate in class regularly.	.32**	.45**	.15*	-.01
4. I interact with my classmates regularly.	.23**	.28**	.15*	-.04

5. I interact with my professors regularly.	.36**	.42**	.18*	-.10
6. My professor(s) are friendly and approachable.	.35**	.22**	.27**	-.26**
7. I feel like my professor(s) care about whether I succeed in class.	.44**	.39**	.41**	-.26**
8. My professor(s) are comfortable using the videoconferencing platform (e.g., Zoom).	.32**	29**	.25**	-.17*
9. I take advantage of one-on-one meetings with my professor(s).	.23**	.32**	-.003	-.06
10. I feel like I learn more in classes with virtual meetings than classes without them.	.30**	.33**	.18*	-.04
11. I like having the routine of attending class meetings.	.40**	.40**	.14+	-.06
12. I appreciate the feeling of connection I get from having virtual class meetings.	.44**	.40**	.20**	-.14+
13. I had a pre-existing friendship with at least one of the other students in my classes.	.18*	.12	.04	-.14+
14. I have developed a friendship with at least one of the other students in my classes.	.18*	.19*	-.02	-.06
15. I miss taking in-person classes.	-.03	-.16*	-.18*	.12

Note. **$p \leq .01$; *$p \leq .05$; +$p \leq .10$

Belongingness was correlated with nearly all items, including participation in classes, interactions with professors, and interactions with classmates. Interestingly, a Hotelling's *t*-test showed that belongingness was significantly more strongly correlated with professor interaction (item 5) than student interaction (item 4), $t(184) = -2.09$, $p = .04$. Thus, although interacting with peers in remote online classes matters, it seems that interacting with professors matters more for belonging.

Similarly, engagement and self-confidence were positively correlated with many items. On the other hand, loneliness exhibited far fewer significant correlations with these variables. Loneliness was associated with perceiving that professors were less friendly, cared less about the student's success, and were less comfortable using videoconferencing technology. Loneliness was also marginally negatively correlated with appreciating the sense of connection in virtual classes and having a pre-existing friendship in a class. The direction of causality is unclear here based on this data; we do not know whether loneliness produces these perceptions, or whether feeling uncared for etc. contributes to greater loneliness.

Discussion

Across two data collection timepoints in fall 2020 and spring 2021, we found many correlates of students' experiences in remote online courses during the COVID-19 pandemic. Importantly, we were able to compare students' perceptions during a pandemic semester in which they did not have control over their course formats compared to a semester in which they did. Our findings have several important implications.

Belonging, Loneliness, and Remote Class Format

Among our results was the finding that the link between class format and students' belonging/loneliness differed depending on the semester. Although unexpected, perhaps the context of the two data collection timepoints can help explain these findings. When students at this university registered for fall 2020 classes, all classes were listed with days and times, as the university administration was hopeful for a return to in-person classes after the disruption of the spring 2020 semester. About two months before fall 2020 began, faculty were informed that courses would be conducted remotely and were offered the choice to conduct their courses asynchronously or synchronously, but information regarding the updated format of the classes was not conveyed to students. Thus, although students knew the courses would be conducted remotely before the semester began, they did not know whether the courses they had registered for would have virtual meetings or be fully asynchronous. It is possible that this lack of choice contributed to these surprising findings. Perhaps students in more synchronous classes felt less belonging and more loneliness because class meetings held via Zoom are quite different to class meetings held in person. For example, peer-to-peer interactions are much more difficult to successfully facilitate in Zoom vs. in-person, particularly if the professor is not comfortable using the intricacies of the videoconference software (e.g., breakout rooms and the chat function). Further, although faculty members had two months before the semester to convert their courses to their chosen format, faculty at this university have a 4/4 teaching load; perhaps faculty members were overburdened during the fall 2020 semester and did not have as much time to facilitate relationships with students in remote online classes as compared to regular in-person classes.

However, we did not replicate this finding in the spring 2021 data. There are many possible reasons why this was the case. First, the context of registration was very different, as students in the spring 2021 data collection had known the format of their classes (synchronous vs. asynchronous) before registering. Perhaps that aspect of choice and expectation produced these different results. Further, spring 2021 participants had been through more of the pandemic than fall 2020 participants, due to the effects of time. Over the course of spring 2021, COVID-19 vaccines were being approved and distributed, which may also have improved students' optimism about the end of the pandemic and thus diminished the negative link found in the previous study. Further research is needed to disentangle the various effects of the pandemic on students' course format experiences.

Work and Family Commitments, Social Contact, and Living Situation

We found that neither working more hours nor spending more time on family obligations were strongly linked with students' belonging/loneliness, though working more hours did predict preferences for course format. Interestingly, while fall 2020 participants were unable to choose their course format and those working more hours had reported wanting to register for more asynchronous and fewer synchronous classes the following semester, spring 2021 participants who were working more hours were indeed taking fewer synchronous classes in the current semester.

These results are promising. Specifically, neither working longer hours nor having increased family obligations seemed to have a negative impact; in contrast, increased family obligations has somewhat of a protective effect on engagement and loneliness. This is in line with previous findings that individuals who perceive higher familial belonging are afforded

protection from perceiving threats to belonging within their college community (Ploskonka & Servaty-Seib, 2015).

Less optimistic was our finding that students' current living situation and social contact with friends and family were all linked with belonging/loneliness to varying degrees. It seems clear that spending less time with friends and family during the pandemic is linked with negative effects for students, particularly greater loneliness. However, the direction of causality is unclear based on the current data. Future research should further examine this question.

First-Generation, Transfer, and First-Semester Students

We also found no links between first-generation status or first-semester status and students' belonging/loneliness, though our findings for transfer students reversed between semesters. Our finding regarding transfer students warrants future study, as we did not expect transfer students to feel marginally more belonging than non-transfer students. Perhaps their experiences at multiple universities helped transfer students adapt to another format of classes more easily than other students. However, the pattern of results flipped in spring 2021, suggesting that these results should be interpreted with caution and explored further in future research.

These results are again promising, particularly for first-generation college students. Although much other research shows a belongingness deficit for first-generation college students (e.g., Stebleton et al., 2014), the current study conducted during the pandemic showed no such difference. The context of the university may have contributed to this; the university in question is a regional comprehensive public university, with a large proportion of first-generation students (approximately 53%). At another type of university (e.g., a research university, a private university), or any university where first-generation students are in the minority, the results may have been different.

Finally, our finding that belonging and loneliness did not differ as a function of time spent at the university was also promising. Many of our participants in each timepoint were in their first semester at the university, meaning they had likely never been on campus or met faculty or fellow students in-person. Based on comments from students in the first author's classes, we expected those students to feel less belonging at the university, but fortunately this was not the case. Perhaps this is a testament to faculty members' welcoming presence in remote classes, or perhaps instead this is due to those students never knowing a different college experience than the remote one. Future research may help examine this in more detail.

Experiences in the COVID-19 Pandemic

Lastly, students' experiences in the pandemic were linked with their belonging/loneliness, particularly their perceptions of how the pandemic affected their psychological health. Although in fall 2020 COVID experiences were negatively correlated with engagement, in spring 2021 those correlations are no longer significant, suggesting perhaps that engagement in remote online classes was no longer impacted by negative mental health consequences of the pandemic, perhaps due to having more experience with remote online classes. Further, our exploratory mediation analysis showed that the link between fall 2020 participants' lower belonging and greater number of synchronous classes was statistically explained by their COVID distress. This might suggest that synchronous classes feel particularly bad for students, as they are a constant reminder of the ongoing pandemic. However, because belonging was not correlated with synchronous classes in the spring 2021 data, we were unable

to replicate this mediation model. Additional research is warranted to further explore these findings; for example, a qualitative study asking students to reflect on their experiences during the 2020–2021 academic year might produce greater insight into these questions.

Overall Implications

This study, conducted during the first full academic year of the COVID-19 pandemic, shed light on students' experiences in their remote online classes. Importantly, although we are now at a later stage in the pandemic as of the time of this writing, it is far from over. At the authors' institution, during the 2021–2022 academic year classes were held almost entirely in-person, with a vaccine mandate and a mask requirement. Though this campus experience is more similar to pre-pandemic classes than remote online classes were, it is still quite different, given masking and social distancing. Further, many college students have grown accustomed to the practices of remote online learning (e.g., online quizzes, posted slides) and may have difficulties adjusting to the expectations of in-person higher education again, or for the first time. Thus, future research should continue examining college students' experiences at each later stage of the pandemic.

Additionally, though many college students are returning to in-person classrooms, the ongoing pandemic may yet preclude a full return to pre-pandemic norms in higher education. For example, as many students and institutions now have experience with virtual settings, online virtual classes may become increasingly common. While much research has explored the predictors of students' success within the traditional classroom or within asynchronous online classes, future research should explore this relationship further (e.g., in post-pandemic synchronous online classes).

Lastly, another area ripe for future research involves replicating our findings in the post-pandemic era. One question which the current research cannot answer is how college students who choose to take virtual classes, whether synchronous or asynchronous, would compare to the present participants who were compelled to take their courses virtually. Perhaps post-pandemic students who freely choose to take remote synchronous courses or asynchronous online courses would not demonstrate the same links we found in the current research. Regardless, more research attention is certainly needed on the question of how to effectively foster belonging and social connection in both remote synchronous and online asynchronous courses moving forward, especially after the transitions both students and faculty have faced during the pandemic. Research might also examine the question of how to implement advising practices which help students make the best choices for classes that will meet their belongingness needs while still making progress toward their degree and balancing their multiple commitments. Identifying factors that promote positive outcomes, as well as those which contribute to negative outcomes in virtual academic settings, has the potential to impact institutions and students significantly going forward.

Limitations

The current study was conducted during two different semesters at a regional comprehensive university in the northeast United States, so the results we found may not generalize to students at other types of universities, in other parts of the United States, or in other parts of the world. Further, our findings were limited by the types of questions we asked; for example, though our questions about course format mismatch did not produce results in spring 2021, this variable may have been important in the context of fall 2020. Further, the study was

correlational in nature, which means we are unable to determine causality. For example, do negative virtual class experiences produce greater loneliness, or vice versa? We hope research will continue to study these topics and help remedy the limitations of the current work.

Conclusion

As higher education continues to change because of the COVID-19 pandemic, it is increasingly important for university administrators, staff members, and faculty members to understand the impact on their students. Knowledge is the first step toward implementing new policies and interventions to help students feel a sense of belonging at their institutions, even during unusual times like the pandemic. The current study offers insight into students' experiences during the 2020–2021 academic year, along with numerous avenues for future research. As we continue to reach each new stage of the pandemic, we believe gaining this knowledge and taking actions based on it are vital to the health of specific universities and higher education.

References

Allen, K., Kern, M. L., Vella-Brodrick, D., Hattie, J., & Waters, L. (2018). What schools need to know about fostering school belonging: A meta-analysis. *Educational Psychology Review, 30*(1), 1–34. https://doi.org/10.1007/s10648-016-9389-8

Anderson, T., & Garrison, D. R. (1998). Learning in a networked world: New roles and responsibilities. In C. Gibson (Ed.), *Distance Learners in Higher Education* (pp. 97–112). Atwood Publishing.

Arslan, G., Yıldırım, M., Aytaç, M. (2020). Subjective vitality and loneliness explain how coronavirus anxiety increases rumination among college students. *Death Studies*, 1–10. https://doi.org/10.1080/07481187.2020.1824204

Arslan, G., Yıldırım, M., & Zangeneh, M. (2021). Coronavirus anxiety and psychological adjustment in college students: Exploring the role of college belongingness and social media addiction. *International Journal of Mental Health and Addiction*. https://doi.org/10.1007/s11469-020-00460-4

Atchley, W., Wingenbach, G., & Akers, C. (2013). Comparison of course completion and student performance through online and traditional courses. *International Review of Research in Open and Distributed Learning, 14*(4), 104–116. https://doi.org/10.19173/irrodl.v14i4.1461

Barreto, M., Victor, C., Hammond, C., Eccles, A., Richins, M. T., & Qualter, P. (2021). Loneliness around the world: Age, gender, and cultural differences in loneliness. *Personality and Individual Differences, 169*(1), 110066*. https://doi.org/10.1016/j.paid.2020.110066

Baumeister, R. F., & Leary, M. R. (1995). The need to belong: Desire for interpersonal attachments as a fundamental human motivation. *Psychological Bulletin, 117*(3), 497–529. https://doi.org/10.1037/0033-2909.117.3.497

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

Bernardon, S., Babb, K. A., Hakim-Larson, J., & Gragg, M. (2011). Loneliness, attachment, and the perception and use of social support in university students. *Canadian Journal of Behavioural Science/Revue canadienne des sciences du comportement, 43*(1), 40–51. https://doi.org/10.1037/a0021199

Borman, G. D., Rozek, C. S., Pyne, J., & Hanselman, P. (2019). Reappraising academic and social adversity improves middle school students' academic achievement, behavior, and well-being. *PNAS*, *116*(33), 16286–16291. https://doi.org/10.1073/pnas.1820317116

Chen, J. C., Dobinson, T., & Kent, S. (2020). Students' perspectives on the impact of Blackboard Collaborate on Open University Australia (OUA) online learning. *Journal of Educators Online, 17*(1).

Cobb, S. (1976). Social support as a moderator of life stress. *Psychosomatic Medicine, 38*(5), 300–314. https://doi.org/10.1097/00006842-197609000-00003

Cohen, A. K., Hoyt, L. T., & Dull, B. (2020). A descriptive study of COVID-19–related experiences and perspectives of a national sample of college students in spring 2020. *Journal of Adolescent Health*, *67*(3), 369–375. https://doi.org/10.1016/j.jadohealth.2020.06.009

Conway III, L. G., Woodard, S. R., & Zubrod, A. (2020). *Social psychological measurements of COVID-19: Coronavirus perceived threat, government response, impacts, and experiences questionnaires*. *PsyArXiv*. https://doi.org/10.31234/osf.io/z2x9a

DiTommaso, E., & Spinner, B. (1997). Social and emotional loneliness: A re-examination of Weiss' typology of loneliness. *Personality and Individual Differences, 22*(3), 417–427. https://doi.org/10.1016/S0191-8869(96)00204-8

Dunleavy, G., & Burke, J. (2019). Fostering a sense of belonging at an international school in France: An experimental study. *Educational and Child Psychology*, *36*(4), 12.

Fink, A., Frey, R. F., Solomon, E. D. (2020). Belonging in general chemistry predicts first-year undergraduates' performance and attrition. *The Royal Society of Chemistry,* 21, 1042–1062. https://doi.org/10.1039/D0RP00053A

Freeman, T. M., Anderman, L. H., & Jensen, J. M. (2007). Sense of belonging in college freshmen at the classroom and campus levels. *Journal of Experimental Education*, *75*(3), 203–220. https://doi.org/10.3200/JEXE.75.3.203–220

Gan S. W., Ong L. S., Lee C. H., & Lin Y. S. (2020). Perceived social support and life satisfaction of Malaysian Chinese young adults: The mediating effect of loneliness. *Journal of Genetic Psychology, 181*(6), 458–469. https://doi.org/10.1080/00221325.2020.1803196

Garris, C. P., & Fleck, B. (2022). Student evaluations of transitioned-online courses during the COVID-19 pandemic. *Scholarship of Teaching and Learning in Psychology, 8*(2), 119-139. https://doi.org/10.1037/stl0000229

Gierveld, J. (1998). A review of loneliness: Concept and definitions, determinants and consequences. *Reviews in Clinical Gerontology, 8*(1), 73–80. https://doi.org/10.1017/S0959259898008090

Gopalan, M., & Brady, S. T. (2020). College students' sense of belonging: A national perspective. *Educational Researcher*, *49*(2), 134–137. https://doi.org/10.3102/0013189X19897622

Gosnell, C. L. (2019). Receiving quality positive event support from peers may enhance student connection and the learning environment. *Scholarship of Teaching and Learning in Psychology*. https://doi.org/10.1037/stl0000178

Hawkley, L., & Cacioppo, J. (2010). Loneliness matters: A theoretical and empirical review of consequences and mechanisms. *Annals of Behavioral Medicine, 40*, 218–27. https://doi.org/10.1007/s12160-010-9210-8

Here's our list of colleges' reopening models. (2020, October 1). *The Chronicle of Higher Education*. https://www.chronicle.com/article/heres-a-list-of-colleges-plans-for-reopening-in-the-fall/

Horigian, V. E., Schmidt, R. D., & Feaster, D. J. (2020). Loneliness, mental health, and substance use among us young adults during COVID-19. *Journal of Psychoactive Drugs, 53*(1), 1–9. https://doi.org/10.1080/02791072.2020.1836435

Hunt, J., & Eisenberg, D. (2010). Mental health problems and help-seeking behavior among college students. *Journal of Adolescent Health, 46*(1), 3–10. https://doi.org/10.1016/j.jadohealth.2009.08.008

Jaggars, S. S., & Xu, D. (2016). How do online course design features influence student performance? *Computers & Education, 95,* 270–284. http://doi.org/10.1016/j.compedu.2016.01.014

Jones, E. J., & Schreier, H. M. C. (2021). Self-rated mental and physical health are prospectively associated with psychosocial and academic adjustment to college. *Journal of the American College Health Association.* Advance online publication. https://doi.org/10.1080/07448481.2021.1904956

Jones, W. H., & Moore, T. L. (1987). Loneliness and social support. *Journal of Social Behavior and Personality, 2*(2), 145–156.

Kong, F., & You, X. (2011). Loneliness and self-esteem as mediators between social support and life satisfaction in late adolescence. *Social Indicators Research, 110*(1), 271–279. https://doi.org/10.1007/s11205-011-9930-6

Labrague, L. J., de los Santos, J. A. A., Falguera, C. C. (2021). Social and emotional loneliness among college students during the COVID-19 pandemic: The predictive role of coping behaviors, social support, and personal resilience. *Perspectives in Psychiatric Care*. 1–15. https://doi.org/10.1111/ppc.12721

Lee, C. M., Cadigan, J. M., & Rhew, I. C. (2020). Increases in loneliness among young adults during the COVID-19 pandemic and association with increases in mental health problems. *Journal of Adolescent Health, 67*(5), 714–717. https://doi.org/10.1016/j.jadohealth.2020.08.009

Lee, C. S., & Goldstein, S. E. (2015). Loneliness, stress, and social support in young adulthood: Does the source of support matter? *Journal of Youth and Adolescence, 45*(3), 568–580. https://doi.org/10.1007/s10964-015-0395-9

Lukács, A. (2021). Mental well-being of university students in social isolation. *European Journal of Health Psychology, 28*(1), 22-29. https://doi.org/10.1027/2512-8442/a000065

Marangoni, C., & Ickes, W. (1989). Loneliness: A theoretical review with implications for measurement. *Journal of Social and Personal Relationships, 6*(1), 93–128. https://doi.org/10.1177/026540758900600107

Maslow, A. H. (1943). A theory of human motivation. *Psychological Review, 50*(4), 370–396. https://doi.org/10.1037/h0054346

McBrien, J. L., Jones, P. T., & Cheng, R. (2009). Virtual spaces: Employing a synchronous online classroom to facilitate student engagement in online learning. *International Review of Research in Open and Distance Learning, 10*(3). https://doi.org/10.19173/irrodl.v10i3.605

McWhirter, B. T. (1990). Loneliness: A review of current literature, with implications for counseling and research. *Journal of Counseling & Development, 68*(4), 417–422. https://doi.org/10.1002/j.1556-6676.1990.tb02521.x

Mellor, D., Stokes, M., Firth, L., Hayashi, Y., & Cummins, R. (2008). Need for belonging, relationship satisfaction, loneliness, and life satisfaction. *Personality and Individual Differences*, *45*(3), 213–218. https://doi.org/10.1016/j.paid.2008.03.020

Miller, K. E. (2021). A light in students' lives: K–12 teachers' experiences (re)building caring relationships during remote learning. *Online Learning, 25*(1), 115–134. https://doi.org/10,24059/olj.v25il.2486

Nieuwoudt, J. E. (2020). Investigating synchronous and asynchronous class attendance as predictors of academic success in online education. *Australasian Journal of Educational Technology, 36*(3), 15–25. https://doi.org/10.14742/ajet.5137

Peacock, S., & Cowan, J. (2019). Promoting sense of belonging in online learning communities of inquiry in accredited courses. *Online Learning, 23*(2), 67–81. https://doi.org/10.24059/olj.v23i2.1488

Peacock, S., Cowan, J., Irvine, L., & Williams, J. (2020). An exploration into the importance of a sense of belonging for online learners. *International Review of Research in Open and Distributed Learning, 21*(2), 18–35. https://doi.org/10.19173/irrodl.v20i5.4539

Peterson, A. T., Beymer, P. N., & Putnam, R. T. (2018). Synchronous and asynchronous discussions: Effects on cooperation, belonging, and affect. *Online Learning, 22*(4), 7–25. https://doi.org/10.24059/olj.v22i4.1517

Ploskonka, R. A., & Servaty-Seib, H. L. (2015). Belongingness and suicidal ideation in college students. *Journal of American College Health*, *63*(2), 81–87. https://doi.org/10.1080/07448481.2014.983928

Ribera, A. K., Miller, A. L., & Dumford, A. D. (2017). Sense of peer belonging and institutional acceptance in the first year: The role of high-impact practices. *Journal of College Student Development, 58*(4), 545–563. https://doi.org/10.1353/csd.2017.0042

Rovai, A. (2002). Building sense of community at a distance. *International Review of Research in Open and Distance Learning, 3*(1). https://doi.org/10.19173/irrodl.v3i1.79

Russell, D., Peplau, L. A., & Ferguson, M. L. (1978). Developing a measure of loneliness. *Journal of Personality Assessment, 42*(3), 290–294. https://doi.org/10.1207/s15327752jpa4203_11

Samuolis, J., & Griffin, K. W. (2014). Identity distress and negative affect in college students. *Identity, 14*(4), 246–254. https://doi.org/10.1080/15283488.2014.944694

Sandstrom, G. M., & Rawn, C. (2015). Embrace chattering students: They may be building community and interest in your class. *Teaching of Psychology, 42*(3), 227–233. https://doi.org/10.1177/0098628315587620

Schwartz-Mette, R. A., Shankman, J., Dueweke, A. R., Borowski, S., & Rose, A. J. (2020). Relations of friendship experiences with depressive symptoms and loneliness in childhood and adolescence: A meta-analytic review. *Psychological Bulletin, 146*(8), 664–700. https://doi.org/10.1037/bul0000239

Shea, P., Swan, K., Li, C. S., & Pickett, A. (2005). Developing learning community in online asynchronous college courses: The role of teaching presence. *Online Learning*. https://doi.org/10.24059/olj.v9i4.1779

Shell, M. D., & Absher, T. N. (2019). Effects of shyness and friendship on socioemotional adjustment during the college transition. *Personal Relationships, 26*(3), 386–405. https://doi.org/10.1111/pere.12285

Shim, T. E., & Lee, S. Y. (2020). College students' experience of emergency remote teaching due to COVID-19. *Children and Youth Services Review*, *119*. https://doi.org/10.1016/j.childyouth.2020.105578

Skylar, A. A. (2009). A comparison of aysnchronous online text-based lectures and synchronous interactive web conferencing lectures. *Issues in Teacher Education, 18*(2), 69–84.

Sollitto, M., Johnson, Z. D., & Myers, S. A. (2013). Students' perceptions of college classroom connectedness, assimilation, and peer relationships. *Communication Education, 62*(3), 318–331. https://doi.org/10.1080/03634523.2013.788726

Stebleton, M. J., Soria, K. M., & Huesman Jr., R. L. (2014). First-generation students' sense of belonging, mental health, and use of counseling services at public research universities. *Journal of College Counseling, 17,* 6–20. https://doi.org/10.1002/j.2161-1882.2014.00044.x

Swan, K. (2002). Building learning communities in online courses: The importance of interaction. *Education, Communication & Information, 2*(1), 23–49. https://doi.org/10.1080/1463631022000005016

Tasso, A. F., Hisli Sahin, N., & San Roman, G. J. (2021). COVID-19 disruption on college students: Academic and socioemotional implications. *Psychological Trauma: Theory, Research, Practice, and Policy*, *13*(1), 9–15. https://doi.org/10.1037/tra0000996

Twenge, J. M., & Joiner, T. E. (2020). Mental distress among US adults during the COVID-19 pandemic. *Journal of Clinical Psychology*, *76*(12), 2170–2182. https://doi.org/10.1002/jclp.23064

Van Orden, K. A., Witte, T. K., James, L. M., Castro, Y., Gordon, K. H., Braithwaite, S. R., Hollar, D. L., & Joiner, T. E., Jr. (2008). Suicidal ideation in college students varies across semesters: The mediating role of belongingness. *Suicide and Life-Threatening Behavior*, *38*(4), 427–435. https://doi.org/10.1521/suli.2008.38.4.427

Walton, G. M., & Cohen, G. L. (2007). A question of belonging: Race, social fit, and achievement. *Journal of Personality and Social Psychology*, *92*(1), 82–96. https://doi.org/https://doi.org/10.1037/0022-3514.92.1.82

Weiss, R. S. (1984). Loneliness: What we know about it and what we might do about it. In L. A. Peplau & S. E. Goldston (Eds.), *Preventing the harmful consequences of severe and persistent loneliness* (p. 3–12). National Institute of Mental Health.

Yorke, M. (2016). The development and initial use of a survey of student "belongingness," engagement and self-confidence in UK higher education. *Assessment & Evaluation in Higher Education, 41*(1), 154–166. http://doi.org/10.1080/02602938.2014.990415

Yust, P. K. S., Liu, J., & Hard, B. M. (2021). Course belonging and engagement in introductory psychology: Why they matter and what predicts them. *Scholarship of Teaching and Learning in Psychology, 7*(3), 206–227. https://doi.org/10.1037/stl0000295

Zumbrunn, S., McKim, C., Buhs, E., & Hawley, L. (2014). Support, belonging, motivation, and engagement in the college classroom: a mixed method study. *Instructional Science*, *42*(5), 661–684. https://doi.org/10.1007/s11251-014-9310-0

First-Time Chinese Online Students' Expectations of Their Instructors in Fully Online Learning Environments

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Abstract
The global COVID-19 lockdowns caused universities to shift from face-to-face instruction to online. Since online teaching was used as a supplement to the traditional in-person instruction before the pandemic in China, Chinese college students were forced to learn in fully online learning (FOL) environments with very little preparation. These first-time online students faced challenges that significantly impacted their confidence and ability to succeed as online learners. Fortunately, the instructor can play a crucial role in conducting early interventions to reduce students' online learning anxiety but understanding these students' expectations of their online instructor is necessary for using appropriate teaching strategies. As a result, this study investigates 439 first-time Chinese online students' expectations of their instructor in FOL environments during the emergent transition. Results indicate that several characteristics are highly expected by new online Chinese learners, such as being familiar with technology, being knowledgeable about the subject, and respecting other students. This study is expected to point Chinese universities and others toward best practices in preparing their faculty members for online course instruction, thus further enhancing first-time online students' learning experiences.

Keywords: Online learning, first-time Chinese online students, students' expectations of instructors, higher education, COVID-19

The coronavirus pandemic forced universities to move in-person courses to online courses worldwide. In response to COVID-19, all universities in China shut down and moved to online courses in early 2020. Before the pandemic, online teaching was simply used as a supplement to the traditional face-to-face instruction in Chinese higher education. Therefore, this emergent transition was the first time that universities offered fully online courses across the nation, and it was also the first time that Chinese college students formerly attended online classes in higher education institutions. Due to the insufficient preparation for fully online learning (FOL), these first-time digital students faced various challenges during this transition. Previous studies showed that students new to online courses are often concerned about their ability to handle the technical, organizational, and social challenges, which could result in a high level of learning anxiety (Whipp & Chiarelli, 2004). Specifically, first-time online students usually experience a high level of anxiety at the beginning of online courses, which may negatively impact their learning process, harm their learning confidence, demotivate their learning passion, and result in their dropping out (Abdous, 2019; Tyler-Smith, 2006). In order to facilitate the learning of students who are new to online courses, the instructor plays a significant role in reducing their anxiety. Yet, before applying appropriate strategies, it is important to first understand these students' expectations of the online instructor, which may be different than the expectations they might have in a traditional in-person course setting.

The multiple challenges students face in online courses lead to their expectations of receiving support from their instructor. These expectations are associated with communication and feedback, technique facilitation, course and activity design, and resource sharing (Baber, 2020; Cole et al., 2017). An early study noted that instructors play essential roles in students' sense of belonging and content mastery by clearly identifying course assignments and effectively designing the course structure (Winkelmes, 2013). Means and Neisler (2021) similarly stated that students' satisfaction levels toward an online course are linked with their instructors' choices regarding how to structure and conduct their courses. They also added that instructors' messages to students checking on learning progress strongly impact student online course satisfaction. While researching from another angle, Vallade and Kaufmann (2018) looked at students' perceptions of instructors' negative behaviors in the online classroom. Six negative behaviors were unique to online courses: refusal to help or answer questions, failure to offer a timely response, failure to access course materials, unclear or confusing assignments, ineffective communication, and last-minute modification. Their study provided insight into students' expectations of their instructors' appropriate behaviors in the online classroom.

Most previous studies investigating students' perceptions of instructors focused on face-to-face class environments (e.g., Ford, 2020; Heo et al., 2020; Johnson & LaBelle, 2017; Millares, 2019; Perera et al., 2020) or involved students without looking at whether they were first-time online learners (e.g., Kara & Can, 2019; Trammell et al., 2016; Welch et al., 2015). There is a general dearth of knowledge regarding first-time online students' expectations of their online instructor. Furthermore, FOL instruction was not a mainstream format in China before the pandemic. It remains unknown what first-time online students expect of their online instructors' behaviors specifically in the context of Chinese universities. As a result, this study specifically investigates first-time Chinese online students' expectations of their instructors in FOL environments. In doing so, we aim to provide best practices for Chinese higher education institutions and beyond in preparing their faculty members for fully online instruction in order to further enhance first-time online students' learning experiences.

Literature Review

Characteristics of a Good Instructor

Generally, scholars identify various significant characteristics of a good instructor, such as being approachable (Ford, 2020; Millares, 2019; Johnson & LaBelle, 2017), confident (Ford, 2020;), authoritative (Raufelder et al., 2016), creative, and interesting (Badrolhisam et al., 2019; Heo et al., 2020; Perera et al., 2020). Other characteristics include encouraging and caring for students (Ford, 2020; Johnson & LaBelle, 2017), being an effective communicator (Said, 2018), appearing to be enthusiastic about teaching (Trammell et al.,2016), remaining flexible and open-minded (Perera et al., 2020), and acting as a good listener (Perera et al., 2020). In terms of being an excellent online instructor, one major characteristic is the ability to provide multiple ways for students to learn (Keetch, 2014; Tonsing-Meyer, 2012), including using technology tools (e.g., videos) and engaging students with different learning styles in much the same way as would occur in a face-to-face classroom (Keetch, 2014; Tonsing-Meyer, 2012). Another important characteristic of online instructors is whether they can provide opportunities for students to engage in higher-order thinking (Kentnor, 2015). Specifically, online instructors should motivate students' "critical, reflective, metacognitive, creative, and logical thinking" (King et al., 1998, p. 1). They should provide timely feedback to encourage the development of a sense of online classroom community (Borel, 2013). Lastly, online instructors should offer sufficient support, including technical, resource, and administrative (Borel, 2013; Kentnor, 2015), which are essential for online learning.

Students' Expectations of the Instructor

Students' expectations of instructors often influence their reactions and course communication, and their expectations can impact how they interpret the message delivered by the instructor and their subsequent behaviors (Frymier & Weser, 2001). Students' instructor expectations can also affect their evaluations of the course and the instructor. If their expectations of the instructor are met or exceeded, they are more likely to rate a higher level of satisfaction with the course and are more willing to take additional courses with this instructor (Gigliotti, 1987). In return, if the instructors can understand their students' expectations, they can adjust their teaching according to students' needs and thus enhance student learning (Trammell et al., 2016).

Students often expect their instructor to own characteristics associated with their personality and profession. For instance, Heo et al. (2020) investigated 332 college students' expectations of their instructor and found that humor, enthusiasm, and entertainment were major characteristics. Some expected their instructor to prepare more course content and interact more often with students. Analyzing feedback from 297 college students, Johnson and LaBelle (2017) confirmed five authentic qualities regarding student expectations of the instructor: approachable, enthusiastic, focused, capable, and knowledgeable. Additionally, students' course evaluations were significantly impacted if they found that their instructor made efforts to engage with them, care for them, and be friendly.

Scholars used the Teaching Behaviors Checklist (Buskist et al., 2002) to specifically investigated the expected instructors' behaviors. Ford (2020) examined the excellent teaching qualities that 204 first-year student pharmacists expected their instructor to have. Among the 28 qualities listed in the checklist, the top 10 excellent teaching qualities are 1) approachable/personable, 2) knowledgeable about subject matter, 3) effective communicator, 4) set realistic expectations, 5) respectful, accessible, 6) enthusiastic about teaching/topic, 7)

understanding, 8) encourages/cares for students, 9) confident, and 10) prepared. Similarly, Perera et al. (2020) requested 270 medical students to rank good qualities they expected for their instructor. The top 10 good qualities from the highest rank to lowest rank were: 1) knowledge towards a subject, 2) enthusiasm regarding teaching and subject, 3) exhibits good communication skills, 4) approachability, 5) good sense of humor, 6) past publication/research, 7) caring nature/empathy, 8) pleasant personality, 9) inspirational/motivational, and 10) conveys constructive criticism.

In addition to collecting survey feedback from students, Millares (2019) interviewed 17 undergraduate students to further look at their expectations of their instructor. Several characteristics were highlighted as key instructor traits. Approachability was identified as an essential, influential characteristic, and included connecting with students, being friendly, being humble, and showing a sense of humor. Students felt encouraged if they had connections with their instructors, such as being called by names. They also preferred a friendly instructor, yet they expected the instructor to push them to excel. Additionally, students considered office hours an effective time in which to approach the instructor. Clear communication was another significant characteristic and included explaining the topic, being easy to understand, using interesting examples, and changing tonation rather than delivering instruction in a monotone. Moreover, being the subject expert was also a major characteristic, indicating that students expected their instructor to provide essential information to facilitate their academic development. Millares (2019) additionally noted that students were eager to receive support from their instructor. In other words, they expected their instructor to care for them, encourage them, and understand them. Lastly, students expected their instructor to be passionate about the subject and motivate their learning. As concluded from previous studies, students often expect their instructors to provide both professional and emotional support.

Students' Expectations of Online Instructors

As to students' expectations of an online instructor, exploring 1480 college students' feedback, Welch et al. (2015) found that pedagogy was considered the essential characteristic while expertise was ranked as the lowest characteristic. Kara and Can (2019) also examined college students' expectations, and they discovered that students expected their online instructor to clearly explain concepts, be available, provide support, and exhibit friendliness and knowledge. Trammell and colleagues (2016) investigated 132 undergraduate students' perspectives of their instructor in online, hybrid, and face-to-face courses. Several characteristics were highlighted, such as being approachable, knowledgeable, enthusiastic, and friendly. Students also expected their instructor to provide feedback on time and to show good teaching skills. Summarized from the previous studies, students had high expectations of their instructor's interpersonal qualities, focusing more on an online instructor's practical course delivery skills. They also expect their instructor to be available for communication and be supportive in an online learning environment.

First-Time Online Students

Online classes are intimidating for students new to online courses, as St Clair (2015) described:

> The pain of anxiety is bad enough, but even worse, many students waste a lot of time worrying; they wait in dread of the online assignment or exam that they cannot open, or the course materials that they will not be able to download from the class site They wrestle with a gnawing fear that their class has no anchor in the physical word and that there will be no one there to address their fears and concerns. We send emails of welcome to students replete with assurances that all will be well, but the apprehension persists (p. 129).

First-time online students often face multiple challenges and learning curves that significantly influence their confidence and ability to succeed online (Tyler-Smith, 2006). These challenges include "technical access, asynchronicity, text-based discussions, multiple conversations, information overload and isolation" (Whipp & Chiarelli, 2004, p. 6). One study (Eshet-Alkalai, 2004) concludes that in addition to being equipped with the ability to use software or operate a technical device, online learners need to have "a variety of complex cognitive, motor, sociological and emotional skills" to "function effectively in digital environments" (p. 93). However, it seems that first-time online students are often concerned about their ability to handle the technical, organizational, and social challenges (Whipp & Chiarelli, 2004). Additionally, these students often struggle with interacting with others (Tseng et al., 2020), and they usually lack the independence and time-management skills to persist in the online course (Tseng et al., 2019).

Accordingly, Tyler-Smith (2006) offers five dimensions first-time online students must deal with in an online learning environment: 1) negotiating the technology, 2) negotiating the learner management system interface, 3) negotiating the learning content, 4) becoming an e-learner, and 5) negotiating computer-mediated communication interaction. Those learning tasks can significantly contribute to online students' cognitive load at the start of an online course. In other words, students new to online learning have to go through cognitive overload in the early stages of an online course (Bawa, 2016). During this period, the multiple learning tasks would lead to "rapid rises in anxiety for the learner" (Tyler-Smith, 2006, p. 80). In short, students' overwhelmed feelings with online learning would negatively influence their learning process, lead to a high level of anxiety at the beginning of the online courses, and further result in a decision of dropping out from the course (Abdous, 2019; Tyler-Smith, 2006).

Online learning anxiety is a common concern according to previous literature, especially for first-time online learners. These students are anxious and afraid of taking their first online course, and they show intense anxiety towards using online technology. Online learning anxiety may further exacerbate all forms of student anxiety, leading to online student retention problems (St Clair, 2015; Tyler-Smith, 2006). Therefore, early intervention is necessary to reduce student online learning anxiety. Scholars have highlighted the importance of the instructor's role in online courses, particularly the skills of designing the sequence of instruction, the course content, and assignments and activities (Miller, 2014; Morrison et al., 2010; Simunich et al., 2015). Meanwhile, the instructor should have clear and consistent course objectives and expectations, as well as assignment criteria (Duncan et al., 2013). In short, it is crucial for the online instructor to provide relevant strategies to engage online students, especially those new to online learning.

The Current Study

Unlike Western cultures characterized by individualism and a small power distance between instructors and students, traditional Chinese culture is dominated by collectivism with considerable distance. Therefore, indirect communication between people is preferred to keep the harmony of a group in Chinese society (Holmes, 2005; Ting-Toomey, 2005). These cultural traits further impact the interpretation and evaluation of classroom management and communication, teaching and learning styles, and teacher-student relationships (Ho, 2001; Holmes, 2005).

Chinese instructors are usually perceived as the authority and transmitter of knowledge (Cortazzi & Jin, 1997), and the traditional Chinese classroom is usually teacher-centered with less interaction and student participation. Instructors' authority and strictness in Chinese culture are considered appropriate, representing a way of caring and nurturing their students (Biggs & Watkins, 2001). Moreover, Chinese instructors and students have little interaction, and students' reticence is considered an expression of showing their respect to their instructor (Ho, 2001; Homes, 2005). Chinese students prefer to use attentive listening, assiduous note-taking, and mechanical memorization (Biggs & Watkins, 1996; Watkins & Biggs, 2001).

The importance of student-centeredness has been recognized in China, and policymakers have carried out related teaching reforms. For example, College English teaching reform has been taking place in China since 2003, aiming to shift teacher-centered classrooms to student-centered classrooms. Some instructors have put effort into changing their teaching concepts and methods by integrating active learning activities (e.g., group learning, debate) to engage students in the classroom and develop their learning abilities (Min, 2016). Yet, classroom silence in college classrooms remains a common phenomenon, leading to inefficient communication between the instructor and students (Chen, 2020; Yi, 2021). Students are usually reluctant to express their ideas and perform passively in class, and they rely heavily on the instructor's explanations. The long tradition of "showing great respect to the teacher and the teacher's teaching" (Min, 2016, p. 456) and the notion that "the teacher is often the dominator of the whole class, and it is the teacher who designs the class, controls and supervises all the students" (p. 456) in a traditional Chinese classroom are deeply ingrained among Chinese instructors and their students. In short, Chinese pedagogy prefers an authoritarian, antisocial, and dialectic approach, which is often test-oriented, information-packed, and holism-based, stressing verbatim memorization, and conformity (Ho, 2001; Holmes, 2005).

Due to the pandemic lockdowns and the sudden shift in instruction, it is unknown whether the expectations toward instructors of Chinese college students new to FOL would change compared to those students might have in a traditional face-to-face learning context. While previous studies focused on the influence of students' characteristics and skills (e.g., mindsets, self-efficacy) during their online learning, a few studies examined factors influencing first-time online students' experiences in FOL environments (Tseng et al., 2020). Looking at first-time online students' expectations of their online instructor specifically in the context of Chinese universities, limited research explores practical strategies instructors should provide. To fill this gap, the present study aims to explore the perspectives of Chinese students' expectations of their online instructor. The research questions that guide this study were:

1. What characteristics of the instructor do first-time online Chinese students expect to be important in fully online courses?

2. What characteristics of the instructor do first-time online Chinese students not expect to be important in fully online courses?

Results from empirical research are needed to close the gap in understanding first-time online students' expectations toward the instructors' qualities and behaviors in a FOL environment; such results may provide insights regarding the best practical strategies instructors may implement to facilitate online learners' success.

Methods

A convenience sampling procedure was used to recruit participants. College students enrolled in one university in northeast China were invited. An invitation email with a link to the survey was distributed and available for two weeks. A total of 439 students participated in the survey. After using the listwise deletion methods, 314 responses were used (usable rate equals 71.5%). Among the students who completed the survey, 140 (44.6%) were male, and 174 (55.4%) were female. Most of the participants were aged 19 to 21 (89.1%). All participants were first-time online students attending fully online courses during the spring semester of 2020.

Instruments

The instrument used to examine first-time Chinese online students' expectations of the instructor was adopted from Buskist and colleagues' (2002) Teacher Behaviors Checklist (TBC) (see Table 1). This inventory consists of 28 items that define personality qualities in terms of instructors' behaviors. The TBC was initially used to rate the top 10 behaviors of an ideal instructor from the 28 items, and it can be used in a Likert-type scale setting based on the study goals (Keeley et al., 2006). Thus, a 5-point Likert-type scale ranging from 1 (not at all important) to 5 (very important), with a midpoint of 3 (neutral), replaced the survey. A higher score indicates that students consider a specific behavior more significant in the fully online course setting. Additionally, as this study aims to explore students' expectations for the online instructor, some behaviors described in the original inventory were revised to better match the online learning environment.

Two factors were identified from the 28 items: 1) caring and supportive (consisting of 13 items) and 2) professional competency and communication skills (consisting of 11 items), leaving four items uncategorized (Keeley et al., 2006). In this study, the Cronbach's alpha for the overall survey with the 28 items was 0.903, with 0.855 for caring and supportive and 0.706 for 11-item professional competency and communication skills, respectively.

Table 1
Sample Items of the Teacher Behaviors Checklist (Buskist et al., 2002)

TBC	Sample items
Caring and supportive	Understanding (Accepts legitimate excuses for missing class or coursework, is available before/after online class to answer questions, doesn't lose temper at students, and takes extra time to discuss difficult concepts);

	Encourages and Cares for Students (Provides praise for good student work, helps students who need it, offers bonus points and extra credit, and knows student names)
Professional competency and communication skills	Technologically Competent (Knows how to use a computer, knows how to use e-mail or social media with students, knows how to use relevant media for learning, know how to use learning management systems, know how to use social media, and encourages students to use technology for learning); Knowledgeable About Subject Matter (Easily answers students' questions, does not read straight from the book or notes, and uses clear and understandable examples)
Uncategorized	Creative and Interesting (Experiments with teaching methods; uses technological devices to support and enhance lectures; uses interesting, relevant, and personal examples); Establishes Daily and Academic Term Goals (Prepares/follows the syllabus and has goals for each class)

Procedure

Students clicked the survey link provided in the invitation email, read the informed consent, and decided whether they were willing to participate in the study. The questionnaire was anonymous and took approximately 8-10 minutes to complete. Students were able to withdraw from the study at any time via closing the website. The original items were in English and needed to be translated into Chinese. The author used a standard translation and back-translation procedure to guarantee the validity of the Chinese version of the measure (Hambleton & Patsula, 1998).

Data Analysis

The listwise deletion method was used in this study, and data were analyzed via Minitab and SPSS. Likert scale is identified as ordinal data (Likert, 1932) that has clear rank order but does not have an even distribution, and arithmetic operations cannot be conducted (Wu & Leung, 2017). Therefore, a one-sample nonparametric hypothesis test was applied to investigate the characteristics that students consider essential or not. Because the data was not symmetric, the sign test was conducted to determine if a statistically significant difference exists between the median of a non-normally distributed continuous data set and a standard. The alpha level was set at .05.

Results

RQ1: What characteristics of the instructor do first-time online Chinese students expect to be important in fully online courses?

Among the 28 characteristics, a median of 19 characteristics is equal to 4 (important), and the median of two characteristics is equal to 5 (very important), respectively (see Table 2).

Table 2

The Median of Instructor's Characteristics

Instructor's Characteristics	Median
Accessible	3
Approachable/Personable	3
Authoritative	3
Confident	3
Creative and Interesting	3
Effective Communicator	3
Encourages and Cares for Students	3
Enthusiastic About Teaching and About Topic	4
Establishes Daily and Academic Term Goals	4
Flexible/Open-Minded	4
Good Listener	4
Happy/Positive Attitude/Humorous	4
Humble	4
Knowledgeable About Subject Matter	5
Prepared	4
Presents Current Information	4
Professional	4
Promotes Class Discussion	4
Promotes Critical Thinking/Intellectually Stimulating	4
Provides Constructive Feedback	4
Punctuality/Manages Class Time	4
Rapport	4
Realistic Expectations of Students/Fair Testing and Grading	4
Respectful	5
Sensitive and Persistent	4
Strives to Be a Better Teacher	4
Technologically Competent	4
Understanding	4

The one-sample nonparametric hypothesis sign test was conducted to examine whether the 19 characteristics with a median of 4 were equal to the hypothesized value of 4 (important).

H1: The Median of the 19 Characteristics is Equal to 4, Respectively. The null hypothesis was rejected as results show that the 19 characteristics with a median equal to 4 were significantly different than the hypothesized value of 4 ($p < .001$). Although some students considered these instructor's qualities and behaviors somewhat unimportant, most of them expected their instructor to have those characteristics. Taking *good listener* as an example, 27

(8.7%) students rated this characteristic neutral to important, 138 (44.2%) rated it important, and 147 (47.1%) rated this quality important to very important. In short, statistics results indicate that all of the 19 characteristics were statistically significantly greater than the hypothesized value 4 (p < .001), indicating that students consider these qualities and behaviors important (see Table 3). Then, the 19 items were tested to examine if they were equal to the hypothesized value of 5 (very important),

H2: The Median of the 19 Characteristics is Equal to 5, Respectively.

The null hypothesis was rejected as results demonstrate that the 19 characteristics with a median equal to 4 were significantly smaller than the hypothesized value of 5 (p < .001). Data confirmed that students rated these 19 instructor's qualities between important to very important (see Table 3).

Table 3

Results of One-sample Nonparametric Hypothesis Sign Test with a Median Value of 4

Characteristics	Number <4	Number =4	Number >4	p-value	Number <5	Number =5	Number >5	p-value
Enthusiastic about teaching and about topic	25	137	150	<.001	162	150	0	<.001
Establishes daily and academic term goals	49	130	133	<.001	179	133	0	<.001
Flexible/Open-minded	35	137	141	<.001	172	141	0	<.001
Good listener	27	138	147	<.001	165	147	0	<.001
Happy/positive attitude/humorous	26	138	147	<.001	164	147	0	<.001
Humble	41	137	133	<.001	178	133	0	<.001
Prepared	40	141	129	<.001	181	129	0	<.001
Presents current information	30	146	137	<.001	176	137	0	<.001
Professional	68	130	114	<.001	198	114	0	<.001
Promotes class discussion	51	137	124	<.001	188	124	0	<.001
Promotes critical thinking/intellectually stimulating	51	131	130	<.001	182	130	0	<.001
Provides constructive feedback	37	138	137	<.001	175	137	0	<.001
Punctuality/manages class time	47	128	136	<.001	175	136	0	<.001
Rapport	28	135	148	<.001	163	148	0	<.001
Realistic expectations of students/fair testing and grading	39	129	144	<.001	168	144	0	<.001
Sensitive and persistent	41	144	128	<.001	185	128	0	<.001

Characteristics	Number <4	Number= 4	Number> 4	p-value	Number< 5	Number= 5	Number> 5	p-value
Strives to be a better teacher	40	131	140	<.001	171	140	0	<.001
Technologically competent	64	122	126	<.001	186	126	0	<.001
Understanding	25	135	153	<.001	160	153	0	<.001

Next, data were analyzed to investigate if the two items whose median equal to 5 are significantly different than the hypothesized value of 5 (very important).

H3: The Median of the Two Characteristics is Equal to 5, Respectively

The null hypothesis was rejected. Results show that the two characteristics were significantly different than the hypothesized value of 5 ($p < .001$). Analysis was then conducted to examine whether these two items were equal to the hypothesized value of 4 (important).

H4: The Median of the Two Characteristics is Equal to 4, Respectively

Again, the null hypothesis was rejected, concluding that students rated these two qualities between important to very important (see Table 4).

Table 4
Results of One-sample Nonparametric Hypothesis Sign Test with a Median Value of 5

Characteristics	Number <4	Number= 4	Number> 4	p-value	Number< 5	Number= 5	Number> 5	p-value
Knowledgeable about subject matter	28	123	162	<.001	151	162	0	<.001
Respectful	34	114	164	<.001	148	164	0	<.001

As statistics results show, students rated both the 19 characteristics with a median equal to 4 and the two attributes with a median equal to 5 between important to very important. The Kruskal-Wallis test, a nonparametric alternative for a one-way ANOVA, was conducted to investigate if students' preferences (between important to very important) of these 21 characteristics differed.

The Kruskal-Wallis test results indicate that students' ratings toward the 21 characteristics were statistically significantly different, $H_{(20)} = 66.40$, $p <.001$. Table 5 shows the pairwise comparisons using the Dunn-Bonferroni tests on each pair of groups, indicating no difference between the two characteristics (i.e., knowledgeable about subject matter, respectful) with a median equal to 5 (Adj. $p = 1$). However, characteristics with a median equal to 4 (i.e., specifically professional, technologically competent) are significantly different than both the characteristics of knowledgeable about subject matter and respectful. Specifically, the post hoc data shows that the median of professional is significantly lower than knowledgeable about subject matter (Test statistics = -666.65, Adj. $p_{professional-knowledgeable} < .001$). Interestingly, although professional is significantly higher than respectful (Test statistics = 679.28, Adj. $p_{professional-respectful} < .001$), even the latter has a median equal to 5. Similarly, technologically competent is significantly higher than both knowledgeable about the subject matter (Test statistics = 531.52, Adj. $p_{technologically\ competent-knowledgeable} = .017$) and respectful (Test statistics = 544.14, Adj. $p_{technologically\ competent-respectful} = .025$).

These results reveal students expected that being familiar with using technology tools as one of the most important instructor characteristics in fully online courses. Additionally, among the characteristics whose median equal to 4, while *professional* is significantly lower than *understanding* (Test statistics = -610.96, Adj. *p* = .002), *enthusiastic about teaching and topic* (Test statistics = -586.44, Adj. *p* = .005), rapport (Test statistics = -555.98, Adj. *p* = .012), it is significantly higher than *happy/positive attitude/humorous* (Test statistics = 557.18, Adj. *p* = .012) and *good listener* (Test statistics = 548.77, Adj. *p* = .015).

Table 5
Pairwise Comparisons of the Median Values of 4 and 5

Characteristics comparisons	Test Stat	Std. Error	Std. Test Stat	Sig.	Adj. Sig.*
Professional vs. Respectful	-666.652	138.079	-4.828	<.001	<.001
Professional vs. Knowledgeable about subject matter	679.277	137.969	4.923	<.001	<.001
Professional vs. Understanding	-610.963	137.969	-4.428	<.001	0.002
Professional vs. Enthusiastic about teaching and about topic	-586.441	138.079	-4.247	<.001	0.005
Professional vs. Rapport	-555.975	138.19	-4.023	<.001	0.012
Professional vs. Happy/positive attitude/humorous	557.182	138.19	4.032	<.001	0.012
Professional vs. Good listener	548.774	138.079	3.974	<.001	0.015
Technologically competent vs. Knowledgeable about subject matter	544.141	137.969	3.944	<.001	0.017
Technologically competent vs. Respectful	531.516	138.079	3.849	<.001	0.025

* Significance values have been adjusted by the Bonferroni correction for multiple tests

RQ2: What characteristics of the instructor do first-time online Chinese students not expect to be important in fully online courses?

Among the 28 characteristics, the median of seven characteristics is equal to 3, respectively (see Table 2). The one-sample nonparametric hypothesis sign test was conducted to examine whether the media of these characteristics is significantly different than the hypothesized value of 3 (neutral).

H5: The Median of the Seven Characteristics is Equal to 3, Respectively.

The null hypothesis was rejected, showing that all the seven characteristics with a median value equal to 3 were significantly different than the hypothesized value 3 (p < .001). Although some students considered these instructors' qualities and behaviors somewhat important, most of the students did not have a high expectation regarding whether their instructor has such characteristics or not. Taking *accessible* as an example, 49 (15.8%) students rated important to very important, 136 (43.7%) rated neutral, and 126 (40.5%) considered this quality low important to not at all important. Statistics results indicate that all the seven characteristics were statistically significantly lower than 3 (p < .001), indicating that students consider those instructor qualities and behaviors not important (see table 6). Lastly, data were analyzed to investigate whether the median of these seven characteristics is different than the hypothesized value of 2 (low important).

H6: The Median of the Seven Characteristics is Equal to 2, Respectively.

The null hypothesis was rejected and data revels that all the seven characteristics were greater than 2, indicating students considered these qualities between neutral to low important (see Table 6). Additionally, the Kruskal-Wallis test results show that students' ratings toward the seven characteristics were not statistically significantly different, $H_{(6)} = 7.10$, $p = .31$.

Table 6

Results of One-sample Nonparametric Hypothesis Sign Test with the Median Value of 3

Characteristics	Number<3	Number=3	Number>3	*p*-value	Number<2	Number=2	Number>2	*p*-value
Accessible	126	136	49	<.001	2	124	185	<.001
Approachable/personable	124	154	32	<.001	1	123	186	<.001
Authoritative	126	138	41	<.001	2	124	179	<.001
Confident	141	144	25	<.001	1	140	169	<.001
Creative and interesting	119	164	26	<.001	1	118	190	<.001
Effective communicator	132	154	24	<.001	1	131	178	<.001
Encourages and cares for students	139	143	30	<.001	3	136	173	<.001

Discussion

Results of the study indicate various characteristics that first-time Chinese online students believe the instructor should have in fully online courses, such as being knowledgeable about the subject, being professional, respecting and understanding students, being a good listener, being enthusiastic about teaching, being humble, and being humorous, being prepared for classes, and having realistic expectations for students. Echoing previous studies (Ford, 2020; Johnson & LaBelle, 2017; Perera et al., 2020), these findings show that first-time Chinese online learners share several common expectations for their instructor, including being an expert on the subject, setting realistic expectations, being respectful, being enthusiastic about teaching/topic, understanding, and being prepared. Promoting critical thinking and online discussion as well as providing constructive feedback are also highlighted by Chinese students new to online learning.

Although scholars (Ford, 2020; Millares, 2019; Perera et al., 2020) note that approachable, accessible, and effective communicator are rated as top characteristics, this study argues that first-time Chinese online students consider these three qualities only somewhat necessary. Furthermore, Chinese students new to online learning do not have much expectation for their instructor to deliver creative and interesting online classes. Likewise, these students do not have a great expectation of receiving encouragement or care from their instructor. These findings somewhat reflect the unique Chinese pedagogy—an authoritarian, antisocial, and dialectic approach, which is often test-oriented, information-packed, and holism-based, stressing verbatim memorization, and conformity (Ho, 2001).

China's unique collectivism, large power distance, and high-context cultures (Hofstede, 1980, 1991) often extend into the classroom, influencing classroom management and communication, teaching, and learning styles, as well as teacher-student relationships (Ho,

2001). Chinese instructors therefore tend to distance themselves from their students. Students accept this interaction style and believe it a way to show their respect to instructors. Interestingly, although Chinese instructors are "expected to exert authority and enforce strictness" (Zhang, 2005, p. 111), the present study argues that first-time online Chinese students do not believe being authoritative is an essential instructor characteristic. Combined with instructor behavior (e.g., rapport, understanding, respectful), results indicate that today's Chinese college students may have a different attitude towards whether the instructor should still be considered as the authority in the classroom. In other words, they may expect their instructors to listen to them, understand them, and build good classroom rapport. Even so, these students still prefer keeping some distance from their instructor as they do not strongly expect receiving care and encouragement. These students' ambivalent feelings may be impacted by the pandemic lockdowns which stimulate their interests to seek a close relationship with their instructor. More research is needed to explore this argument.

Of the 28 instructor's characteristics, 21 of them were considered important by first-time Chinese online students. Among these characteristics, 11 (52.4%) of them are categorized as caring and supportive factors (e.g., understanding, provides constructive feedback) while 7 (22%) of them are grouped into professional competency and communication skills (e.g., knowledgeable about the subject matter, technologically competent). Meanwhile, among the characteristics rated as neutral to low importance, two (28.6%) of them belong to the caring and supportive sector (i.e., accessible, encourages and cares for students), and four (57.1%) are identified as belonging to the professional competency and communication skills group. Mirroring Millares' (2019) conclusions that students are usually eager to receive support and encouragement from their instructor, the present study shows that first-time Chinese online students consider instructor's characteristics related to caring and support as more significant than those associated with professional competency and communication skills in FOL environments.

Finally, knowledge about the subject is often rated as the top characteristic for effective instructors (Ford, 2020; Perera et al., 2020). This study, however, argues that first-time, online students in China considered technological competence to be a more important instructor characteristic than being the expert of the subject. These students may encounter various challenges when learning online for the first time (Tyler-Smith, 2006), such as how to effectively use the online educational tools to interact with the learning content, instructor, and peers (Tseng et al., 2020). Therefore, as indicated in the present study, it is assumed that these students expect their instructor to be experienced with technology and someone learners could trust and rely on when they need help in FOL environments.

Implications

There are several strategies that instructors could use to help Chinese students new to online learning smoothly adapt to their first online course. First, the instructors should be familiar with using technology tools when teaching online courses, so they can lend a hand to students when necessary. They may implement practices such as collecting information related to technology access and share it with students to solve possible issues; they could also provide alternative ways of engagement when designing course activities and group projects (Means & Neisler, 2021). Additionally, universities should provide workshops or training to improve instructors' technical competence. Second, online instructors should know the content and prepare the online course by providing necessary materials. Online instructors should also hold

realistic expectations of their students, not overloading them with readings and assignments. Additionally, online instructors should provide constructive feedback, which is considered an important indicator of instructor presence in online learning environments (Sheridan & Kelly, 2010). Furthermore, online instructors should be sensitive and persistent. That is, they should evaluate whether first-time online students understand the course materials before moving to new learning content. The instructors should repeat information and check students' understanding of the course materials when necessary. Moreover, online instructors should promote online discussions and encourage students' critical thinking, such as raising challenging questions. Although first-time Chinese online students may not expect to receive much encouragement and care from their instructors, nor do they expect their instructors to be always accessible or approachable in FOL environments, learners prefer a good online classroom rapport. They believe their instructor should respect and understand them. Thus, relevant strategies should include calling students' names when replying to their emails or discussion posts, using jokes and stories to lighten up the online class atmosphere, and being polite to them and not embarrassing them while they share viewpoints on discussion boards.

As first-time Chinese online students focus more on instructor's characteristics linked to caring and support than those related to professional competency and communication skills, online instructors should pay more attention to providing these students' emotional support. For instance, the instructors could create a pleasant and relaxing learning environment, provide online office hours for questions, and remain patient when students make mistakes or ask repeated questions. As noted by scholars (Tseng et al., 2019; 2020), students taking fully online courses for the first time often struggle with using technology tools, interacting with the course content, the instructor, and their peers. First-time Chinese online students may also lack the independence and time-management skills to persist in the online course, resulting in their decision to drop out of the course (Abdous, 2019; Tyler-Smith, 2006). Therefore, early intervention is important to reduce their online learning anxiety. The instructor could collect mid-semester feedback from students to modify the online course assignments and activities, talk with students to help them adjust their study plans, and provide resources to solve students' problems in the online learning context. In addition to applying strategies such as a well-developed sequence of instruction, the course content, assignments, and activities (Miller, 2014; Morrison et al., 2010; Simunich et al., 2015), our findings agree that the online instructors should have clear and consistent objectives and expectations as well as assignment criteria (Duncan et al., 2013). The above behaviors would emotionally support those who are new to online learning.

Lastly, instead of considering the instructors as the authority in the classroom, today's Chinese college students expect to build a good relationship with their instructors, facilitating good listening on both sides. At the same time, in lieu of being stereotyped as Chinese students who are attentive, diligent with note-taking, and fierce with mechanical memorization (Hu & Grove, 1999; Watkins & Biggs, 2001), today's Chinese college students prefer having more class discussions and other interactions with their instructor and peers. Thus, it is essential for Chinese higher education professionals to rethink their roles and responsibilities in a course, especially in the online classroom setting. Students are the participants, listeners, helpers in group learning, and center of the classroom activities. Therefore, the instructors should shift their roles from the dominant authority and controller to the organizer, instructor, monitor, helper, and evaluator (Hu, 2017; Min, 2016).

Limitations

Some limitations exist in the study. First, participants were recruited in one university in China and cannot represent all first-time Chinese online students. Future studies should involve college students from different Chinese universities. Second, this study investigates first-time Chinese online students' expectations of their instructor without dividing online course formats (i.e., synchronous, asynchronous, and blended). These students may have different expectations of their instructor for online courses in different modalities. As a result, future studies should further look into various course formats. It is also possible that some students shared their expectations of the instructor based on their experiences of the course itself, and this limitation may somehow impact the validity of the results. Therefore, qualitative or a mixed research method should be used for follow-up studies. In addition, comparisons across years of schooling could provide more precise information to check on any variation in students' expectations across the course terms. Thus, it is suggested that future studies use both pre- and post-course surveys or conduct a longitudinal study. Also, the pandemic is one significant factor that may impact students' attitudes toward online learning and their online instructor. Therefore, it is necessary to compare students' expectations of the instructor before, during, and after the pandemic. Finally, students' majors may influence their expectations of the online instructor. It is assumed that the expectations of students in STEM (e.g., math, physics) may vary more than those in non-STEM (e.g., English, business). Thus, future studies should take the subject matter into consideration. Still, the study's limitations did not negate recognizing first-time Chinese online students' expectations of their instructor in FOL environments.

Conclusions

This study explores first-time online students' expectations of their instructor in FOL environments specifically within the context of Chinese universities. Several behaviors are identified as crucial such as being knowledgeable about the subject, being professional, and having realistic expectations for students. Students new to online learning specifically highlight the importance of technological competence—a characteristic that is rarely mentioned in previous research. In other words, Chinese students new to online learning expect their instructors to use technology tools professionally in FOL environments.

Additionally, other than considering the instructor as the authority in the classroom, today's Chinese students believe receiving emotional support from their instructors—including the expectation that their instructor will respect and understand them and be a good listener—are significant. Future studies are suggested to further explore the shift of students' attitudes through comparisons across course terms as well as before, during, and after the pandemic. More factors should be considered as well including students' majors and online course delivery formats.

In short, as online learning has grown steadily worldwide and will become mainstream by 2025 (Palvia et al., 2018), this study offers insights for higher education professionals, in China and beyond, working toward a better understanding of first-time online students' expectations of their instructor. Additionally, we hope this study will contribute to scholarship on best practices in preparing their university faculty members for online course instruction, thus enhancing learning experiences of students new to online learning.

Declarations
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References

Abdous, M. (2019). Influence of satisfaction and preparedness on online students' feelings of anxiety. *Internet & Higher Education, 41*, 34–44. https://doi.org/10.1016/j.ihedu c.2019.01.001

Baber, H. (2020). Determinants of students' perceived learning outcome and satisfaction in online learning during the pandemic of COVID-19. *Journal of Education and E-Learning Research, 7*(3), 285-292. http://doi.org/10.20448/journal.509.2020.73.285.292

Badrolhisam, N. I., Rashid, N. M., Ma'amor, H., Mansor, M. N. M., & Bashirun, S. N. (2019). Students' perception, expectation and satisfaction toward the characteristics of female lecturers in higher education. *Universal Journal of Educational Research*, *7*(10A), 1–6. https://doi.org/10.13189/ujer.2019.071701

Bawa, P. (2016). Retention in online courses: Exploring issues and solutions—A literature review. *Sage Open, 6*(1), 2158244015621777.

Biggs, J., & Watkins, D. (1996). The Chinese learner in retrospect. In D. A. Watkins & J. B. Biggs (Eds.), *The Chinese learner: Cultural, psychological and contextual influences* (pp. 269–286). Comparative Education Research Center.

Borel, D.A. (2013). *The influence of web conferencing on graduate students' sense of community in an online classroom* (Publication number 3562263) [Doctoral dissertation, Lamar University—Beaumont]. ProQuest Dissertations & Theses Global.

Buskist, W., Sikorski, J., Buckley, T., & Saville, B. K. (2002). Elements of master teaching. In S. F. Davis & W. Buskest (Eds), *The teaching of psychology: Essays in honor of Wilbert J. McKeachie and Charles L. Brewer* (pp. 27−39). Psychology Press.

Chen, S. (2020). Classroom Silence in College English Class in China. *Us-China Foreign Language*. http://doi.org/10.17265/1539-8080/2020.05.001

Cole, A., Anderson, C., Bunton, T., Cherney, M., Fisher, V. C., Featherston, M., ... & Allen, M. (2017). Student predisposition to instructor feedback and perceptions of teaching presence predict motivation toward online courses. *Online Learning Journal, 21*(4).

Cortazzi, M., & Jin, L. (1997). Communication for learning across cultures. In D. McNamara & R. Harris (Eds.), *Overseas students in higher education* (pp. 76−90). Routledge.

Duncan, H. E., Range, B., & Hvidston, D. (2013). Exploring student perceptions of rigor online: Toward a definition of rigorous learning. *Journal on Excellence in College Teaching, 24*(4), 5–28.

Eshet, Y. (2004). Digital literacy: A conceptual framework for survival skills in the digital era. *Journal of educational multimedia and hypermedia, 13*(1), 93-106.

Ford, C. R. (2020). Exploring first-year student pharmacists' expectations in the classroom. *Pharmacy Teaching and Learning, 12*(6), 694–700. https://doi.org/10.1016/j.cptl.2020.01.033

Frymier, A. B., & Weser, B. (2001). The role of student predispositions on student expectations for instructor communication behavior. *Communication Education, 50*(4), 314–326. https://doi.org/10.1080/03634520109379258

Gigliotti, R. J. (1987). Are they getting what they expect? *Teaching, Sociology, 15*(4), 365–375. https://doi.org/10.2307/1317992

Hambleton, R. K., & Patsula, L. (1998). Adapting tests for use in multiple languages and cultures. *Social indicators research, 45*(1-3), 153–171. https://doi.org/10.1023/A:1006941729637

Heo, W., Park, N., & Park, K. (2020). Classifying students using an expectation-perception survey about a hospitality laboratory class: Empirical research with the finite mixture model. *Anatolia*, *31*(1), 50–61. https://doi.org/10.1080/13032917.2019.1697890

Ho, I. T. (2001). Are Chinese teachers authoritarian? In D. A. Watkins & J. B. Biggs (Eds.), *Teaching the Chinese learner: Psychological and pedagogical perspectives* (pp. 99–114). Comparative Education Research Center.

Holmes, P. (2005). Ethnic Chinese students' communication with cultural others in a New Zealand university. *Communication education, 54*(4), 289-311. https://doi.org/10.1080/03634520500442160

Hu, W., & Grove, C. L. (1999). *Encountering the Chinese: A guide for Americans*. Intercultural Press.

Johnson, Z., & LaBelle, S. (2017). An examination of teacher authenticity in the college classroom. *Communication Education*, *66*(4), 423–439. https://doi.org/10.1080/03634523.2017.1324167

Kara, M. & Can, G. (2019). Master's students' perceptions and expectations of good tutors and advisors in distance education. *International Review of Research in Open and Distributed Learning, 20*(2). https://www.erudit.org/en/journals/irrodl/1900-v1-n1-irrodl04703/1061336ar.pdf

Keeley, J., Smith, D., & Buskist, W. (2006). The Teacher Behaviors Checklist: Factor analysis of its utility for evaluating teaching. *Teaching of Psychology*, *33*(2), 84–91. https://doi.org/10.1207/s15328023top3302_1

Keetch, J. W. (2014). *An analysis of progressive elements in top-tiered online graduate programs of higher education* (Publication number 3627409) [Doctoral dissertation, Saint Louis University]. ProQuest Dissertations & Theses Global.

Kentnor, H. E. (2015). *Investigating and understanding student learning outcomes in an online and face-to-face graduate level legal administration course: An embedded mixed methods design* (Publication number 3715376) [Doctoral dissertation, University of Denver]. ProQuest Dissertations & Theses Global.

King, F., Goodson, L., & Rohani, F. (1998). *Higher order thinking skills: Definition, teaching strategies, assessment.* Center for Advancement of Learning and Assessment.

Likert, R. (1932). A technique for the measurement of attitudes. *Archives of psychology. 22*(5), 5-55.

Means, B., & Neisler, J. (2021). Teaching and learning in the time of COVID: The student perspective. *Online Learning, 25*(1), 8-27.

Millares, C. A. A. (2019). The effects of instructor characteristics and student gender on student expectations of instructor effectiveness*: A mixed methods study* [Doctoral dissertation, Texas Tech University]. TTU DSpace. https://ttu-ir.tdl.org/handle/2346/85040

Miller, M. D. (2014). *Minds online: Teaching effectively with technology*. Cambridge, MA: Harvard University Press.

Min, H. (2016). A study on silence phenomenon in college English classroom. *International Journal of Education and Research, 4*(6), 451-458.

Morrison, G. R., Ross, S. M., Kemp, J. E., & Kalman, H. (2010). *Designing effective instruction. Hoboken*. Wiley.

Palvia, S., Aeron, P., Gupta, P., Mahapatra, D., Parida, R., Rosner, R., & Sindhi, S. (2018). Online education: Worldwide status, challenges, trends, and implications. *Journal of Global Information Technology Management, 21*(4), 233-241. https://doi.org/10.1080/1097198X.2018.1542262

Perera, S., Fong, T. Y., Balasubramaniam, J., & Kavita, K. (2020). What qualities do medical students expect in an effective teacher: A cross sectional study. *Medicine Journal*, *7*(1), 1–11.

Raufelder, D., Nitsche, L., Breitmeyer, S., Keßler, S., Herrmann, E., & Regner, N. (2016). Students' perception of "good" and "bad" teachers—Results of a qualitative thematic analysis with German adolescents. *International Journal of Educational Research*, *75*(2016), 31–44. https://doi.org/10.1016/j.ijer.2015.11.004

Said, A. (2018). Vocational teaching-learning through the eyes of undergraduate vocational students in Malta: A qualitative exploratory study. *International Journal for Research in Vocational Education and Training, 5*(1), 42–63. https://doi.org/10.13152/IJRVET.5.1.3

Sheridan, K., & Kelly, M. A. (2010). The indicators of instructor presence that are important to students in online courses. *Journal of Online Learning and Teaching, 6*(4), 767-779.

Simunich, B., Robins, D. B., & Kelly, V. (2015). The impact of findability on student motivation, self-efficacy, and perceptions of online course quality. *American Journal of Distance Education, 29*(3), 174–185. https://doi.org/10.1080/08923647.2015.1058604

St Clair, D. (2015). A simple suggestion for reducing first-time online student anxiety. *Journal of Online Learning and Teaching, 11*(1), 129.

Ting-Toomey, S. (2005). The matrix of face: An updated face-negotiation theory. In W. B. Gudykunst (Ed.), *Theorizing About Intercultural Communication* (pp. 71–92). Sage.

Tonsing-Meyer, J. A. (2012). *An examination of online instructional practices based on the learning styles of graduate education students* (Publication number 3516155) [Doctoral dissertation, Northcentral University]. ProQuest Dissertations & Theses Global.

Trammell, Beth, & Aldrich, Rosalie. (2016). Undergraduate students' perspectives of essential instructor qualities. *The Journal of Scholarship of Teaching and Learning*, *16*(1), 15–30. https://doi.org/10.14434/josotl.v16i1.19178

Tseng, H., Kuo, Y. C., & Walsh, E. J. (2020). Exploring first-time online undergraduate and graduate students' growth mindsets and flexible thinking and their relations to online learning engagement. *Educational Technology Research and Development, 68*(5), 2285-2303. https://doi.org/10.1007/s11423-020-09774-5

Tseng, H., Yeh, H.-T., & Tang, Y. (2019). A close look at trust among team members in online learning communities. *International Journal of Distance Education Technologies, 17*(1), 52–65.

Tyler-Smith, K. (2006). Early attrition among first time eLearners: A review of factors that contribute to drop-out, withdrawal and non-completion rates of adult learners undertaking eLearning programmes. *Journal of Online learning and Teaching, 2*(2), 73-85.

U.S. Department of Education. (2020). *Digest of Education Statistics* 2020. National Center for Education Statistics. https://nces.ed.gov/fastfacts/display.asp?id=80

Vallade, J. I., & Kaufmann, R. (2018). Investigating instructor misbehaviors in the online classroom. *Communication Education, 67*(3), 363-381. https://doi.org/10.1080/03634523.2018.1467027

Watkins, D. A., & Biggs, J. B. (2001). *Teaching the Chinese learner: Psychological and pedagogical perspectives*. Comparative Education Research Center.

Welch, A. G., Orso, D., Doolittle, J., & Areepattamannil, S. (2015). Matching student expectations with instructors' dispositions: Insight into quality of online teaching. *Journal of Effective Teaching*, *15*(2), 5–19.

Whipp, J. L., & Chiarelli, S. (2004). Self-regulation in a web-based course: A case study. *Educational technology research and development, 52*(4), 5-21.

Winkelmes, M-A. (2013). Transparency in teaching: Faculty share data and improve students' learning. *Liberal Education, 99*(2): 48–55.

Wu, H., & Leung, S. O. (2017). Can Likert scales be treated as interval scales?—A Simulation study. *Journal of Social Service Research, 43*(4), 527-532. https://doi.org/10.1080/01488376.2017.1329775

Yi, S., Yun, R., Duan, X., & Lu, Y. (2021). Similar or different? a comparison of traditional classroom and smart classroom's teaching behavior in China. *Journal of Educational Technology Systems, 49*(4), 461-486. https://doi.org/10.1177/0047239521988999

Zhang, Q. (2005). Immediacy, humor, power distance, and classroom communication apprehension in Chinese college classrooms. *Communication Quarterly, 53*, 109–124. https://doi.org/10.1080/01463370500056150

The Role of Evaluation Methods in Health-Related E-learning: A Rapid Review

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Abstract
Training and development programs are increasingly delivered online with numerous studies reporting no differences in learning outcomes between online and traditional learning. However, there are no established standardized methods to evaluate the effectiveness of online learning. This review aims to map the state of research around health-related education to determine what e-learning evaluation methods are being used, the strengths or deficiencies of these methods, and which are appropriate for measuring the effectiveness of online education. Databases searched were PubMed, ProQuest, Education Resources Information Centre, Cumulative Index to Nursing and Allied Health Literature, Scopus, PsychInfo, and Medline. Studies were included if they were published between 2011 and 2021, reported health-related online education and included an evaluation component. Thirty studies were obtained from numerous countries with varied methodologies and designs. Participants ranged from undergraduate students to medical professionals. Evaluation methods included student participation, students' reaction to the training program, self-efficacy, knowledge assessment, long-term performance, and the Kirkpatrick Evaluation Framework. The review identified that course evaluations, such as measuring student satisfaction scores alone, are insufficient when used to quantify learning effectiveness for online education. This was particularly important as studies are reporting these single metrics as positive effects of training interventions without justification. Suggestions within the reviewed papers were to adopt and implement an appropriate validated method within the course curriculum to evaluate learning outcomes.

Keywords: assessment tools, evaluation method, learning impact measure, outcome measure, e-learning, online education, online learning, health education, healthcare

Workplace educational training and development plays a critical role in staff development and organizational efficiency, helping organizations achieve goals and objectives. The way training is designed, delivered, and implemented contributes to the success or failure of these outcomes (Salas et al., 2012). The last decade has seen the workplace training function driven by a legal requirement to ensure businesses comply with regulations, such as health and safety requirements (Khan, 2011).

In many organizations, training and development opportunities have been encouraged to improve staff skills and improve operational efficiencies (Hughes et al., 2016). This has resulted in an increase in professional development opportunities to extend skills and knowledge in the workforce and allow organizations to take advantage of technological advances.

As part of quality improvement and patient safety in health, Australia introduced continuing professional development requirements in 2015 to educate staff about current advances in health and care practices and the use of innovative technologies in healthcare (Australian Health Practitioner Regulation Agency, 2019).

The recent 2019 coronavirus pandemic (COVID-19) has had a major impact on teaching and learning, with organizations and higher educational facilities worldwide shifting to online platforms instead of the traditional face-to-face learning environment (Dhawan, 2020; Pokhrel & Chhetri, 2021). In health for example, e-learning in specialized medical training, such as in surgical settings, can include virtual patient cases, digital modelling, online tutorials, and standardized videos and images (Jayakumar, 2015).

Despite large investments in workplace education and professional development activities, there is little evidence about the effectiveness of online education compared to traditional face-to-face learning (Vaona et al., 2018). There is a variety of individual metrics for measuring training effectiveness and evaluation frameworks like the Kirkpatrick evaluation model (Kirkpatrick, 1994; Kirkpatrick & Kirkpatrick, 2006) for the measurement and evaluation of learning. However, there are no agreed standardized methods to measure effectiveness and no assessment of outcomes between online and traditional learning (Vaona et al., 2018).

Background

In response to the COVID-19 pandemic, governments around the world introduced a series of phased restrictions and lockdowns to manage the spread of the disease. This included limiting face to face interactions and encouraging online work, training, and education. In health, the COVID-19 pandemic resulted in a significant increase in e-learning across many aspects of the professional development education and training program. This highlighted a need for better measurement, assessment, and evaluation of online learning.

With a significant uptake in online education and training, health organizations need to ensure that professional development training allows health care professionals to maintain and improve standards of practice through the development of knowledge, skills, and behavior. This process requires robust methods for the measurement, assessment, and evaluation of online education. In this rapidly changing environment health organizations are keen to know about the changes in e-learning practices and outcomes across all aspects of health. This rapid review identifies some of the new and emerging methods and practices for evaluating e-learning. This includes building on previous reviews that were limited in focus and identifies changes to practice, to assess what is already known about e-learning practice and gaps in evaluation methods.

Previous Systematic Reviews

In the past ten years there have been seven health-related systematic reviews undertaken to investigate the effectiveness of online training to improve participants' knowledge, skills and competencies (Barteit et al., 2020; Campbell et al., 2019; Lima et al., 2019; Moehead et al., 2020; Rouleau et al., 2019; Salter et al., 2014; Zafar et al., 2014). Looking at e-learning in nursing, pharmacy, radiology, dementia, and orthodontics. Many of the reviews identified a need for better measurement, assessment, and evaluation of online learning.

The challenges reported within these reviews highlighted a need to understand whether e-learning models can improve professional practice, professional knowledge, and the long-term effects compared to face-to-face learning. Many of the studies identified in the reviews were small-scale and short-term, often with limited granularity of reported details, overrepresentation of the effects of e-learning intervention, and underrepresentation of patient and practice outcomes.

Previous systematic reviews have focused on very specific areas within health without looking across the health landscape to identify and report different practices. This review covers ten years (including two pandemic years) during which advances in internet bandwidth, technology, and software have supported a shift to online training.

Objectives of the Review

This review aimed to identify new methods of measurement and assessment, as well as gaps and limitations to initiate discussion of valid evaluation within the health field. The objective is to map the state of research to determine what evaluation methods are currently used in health-related online education. In addition, the review aimed to summarize the strengths and limitations of these evaluation methods and recommend which of these methods could be used to measure the effectiveness of online health education.

Methods

We conducted a rapid review to identify online education evaluation methods specific to health-related training. A rapid review is an abbreviated systematic review that gathers and synthesizes study findings in a short amount of time. A rapid review can be used to address a wide range of issues and to help provide recommendations that can be used to inform policy and systems decisions (Tricco et al., 2017). Methods and results were reported using Rapid Reviews to Strengthen Health Policy and Systems (Tricco et al., 2017) and the 2020 Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) statement (Page et al., 2021). See Supplementary Table 1. For this review, we define online learning and e-learning as an educational intervention that is delivered electronically through computer networks with *no physical classroom attendance*. The review does not include face-to-face or blended education models.

Protocol Development

The protocol was developed based on the population, intervention, comparison, and outcome (PICO) framework (Huang, Lin, & Demner-Fushman, 2006). Table 1 provides an overview of the protocol used to inform the search strategy.

Table 1

Protocol Development Using the PICO Framework

Parameter	Description
Population	Health care professionals or health-related students.
Intervention	Health-related courses delivered online with no face-to-face component.
Comparison	Type of evaluation method used.
Outcome	Performance, effectiveness, and limitations of the evaluation component.

Database Search

Seven databases (PubMed, ProQuest, Education Resources Information Centre [ERIC], Cumulative Index to Nursing and Allied Health Literature [CINAHL], Scopus, PsychInfo, and Medline) were searched for studies published between 2011 and early 2021. Using appropriate search strings and Medical Subject Headings (MeSH), the keywords used were related to the PICO framework and included e-learning, performance, efficiency, evaluation, assessment, and Kirkpatrick (see Table 2).

Table 2

Search Method and Number of Results per Database

Search Method	Pubmed	ProQuest	EBSCO (ERIC, CHINAHL)	Scopus	Ovid (PsychInfo, Medline)
TITLE-ABS-KEY (Kirkpatrick OR ADDIE OR Kaufman OR Brinkerhoff OR LTEM OR reflective OR "course evaluation" OR "education assessment" OR "evaluation model" OR LMS OR HRIS OR "personalised learning" OR "personalized learning" OR QILT OR "learning satisfaction") AND (elearning OR e-learning OR "electronic learning" OR "online learning" OR "online training" OR "open learning" OR "massive open online courses") AND ("return on investment" OR ROI OR performance OR efficiency OR efficacy OR cost OR financial) AND 2011-2021 AND ENGLISH AND Article OR Review AND Open Access (peer reviewed scholarly and unrestricted online access)			76	119	

(Kirkpatrick OR ADDIE OR Kaufman OR Brinkerhoff OR LTEM OR reflective OR "course evaluation" OR "education assessment" OR "evaluation model" OR LMS OR HRIS OR "personalised learning" OR "personalized learning" OR QILT OR "learning satisfaction") AND (elearning OR e-learning OR "electronic learning" OR "online learning" OR "online training" OR "open learning" OR "massive open online courses") AND ("return on investment" OR ROI OR performance OR efficiency OR efficacy OR cost OR financial) AND 2011-2021 AND ENGLISH AND Full-Text	7
AB-TI-SU((Kirkpatrick OR ADDIE OR Kaufman OR Brinkerhoff OR LTEM OR reflective OR "course evaluation" OR "education assessment" OR "evaluation model" OR LMS OR HRIS OR "personalised learning" OR "personalized learning" OR QILT OR "learning satisfaction") AND (elearning OR e-learning OR "electronic learning" OR "online learning" OR "online training" OR "open learning" OR "massive open online courses") AND ("return on investment" OR ROI OR performance OR efficiency OR efficacy OR cost OR financial)) AND 2011-2021 AND ENGLISH AND Full Text AND Peer Reviewed	139
TITLE-ABS ((Kirkpatrick OR ADDIE OR Kaufman OR Brinkerhoff OR LTEM OR reflective OR "course evaluation" OR "education assessment" OR "evaluation model" OR LMS OR HRIS OR "personalised learning" OR "personalized learning" OR QILT OR "learning satisfaction") AND (elearning OR e-learning OR "electronic learning" OR "online learning" OR "online training" OR "open learning" OR "massive open online courses") AND ("return on investment" OR ROI OR performance OR efficiency OR efficacy OR cost OR financial)) AND 2011-2021 AND ENGLISH AND Articles OR Reviews AND Full-Text	121

Note. Abbreviations: ADDIE, Analysis, Design, Development, Implementation, and Evaluation; CINAHL, Cumulative Index to Nursing and Allied Health Literature; ERIC, Education Resources Information Centre; HRIS, Human Resource Management System; QUILT, Quality Indicators for Learning and Teaching; LMA, Learning Management System; LTEM, Learning-Transfer Evaluation Model; ROI, Return on Investment.

Inclusion Criteria

Eligible studies were defined as scholarly, peer-reviewed articles published between 2011 and 2021 available in full text. A timeframe of 10 years was agreed upon and selected to limit the results of studies published using distance education methods described above. This included e-learning interventions relevant to health involving higher education students or healthcare personnel (i.e., continuing professional development) with an evaluation component. To understand the effectiveness of the evaluation components, eligible studies were required to report on the strengths and weaknesses of the methods used.

Exclusion Criteria

Grey literature articles, book chapters, conferences, opinions, proposals, or comment pieces were excluded from the review. In addition, technology acceptance, software evaluations concerning the e-learning platform, and medical interventions (such as clinical trials) were also removed since learning effectiveness was the focus of the review. Any blended or hybrid learning models, which included face to face or correspondence-based learning not completely delivered online, were excluded.

Screening and Study Selection

After restricting the database search to full-text, peer-reviewed articles, a total of 462 studies were retrieved and imported into Covidence Systematic Review Software (Veritas Health Innovation, 2019). Of these, 105 were duplicates leaving 357 for screening. Two reviewers screened the studies for relevance based on titles and abstracts, and then later by full text. The screening strategy was broad, looking to exclude articles that were not health-related, had no mention of an online education component or met the exclusion criteria. Uncertain articles were retained for review in the full-text screening stage. Of the 357 studies, 108 were retained for full-text screening, and 81 were finally excluded. The final 27 articles were considered appropriate and retained. Reference lists were exported from the Scopus database and citations from the retained articles were exported using the Publish or Perish software (Harzing, 2007). These articles were then imported into Excel and screened by title and abstract by the two reviewers, where three articles were retained. There were 30 articles included in the final selection. A PRISMA flow diagram shows the articles selected for inclusion and exclusion (Figure 1).

Figure 1

PRISMA Flow Diagram for Study Selection (adapted from Page et al., 2021)
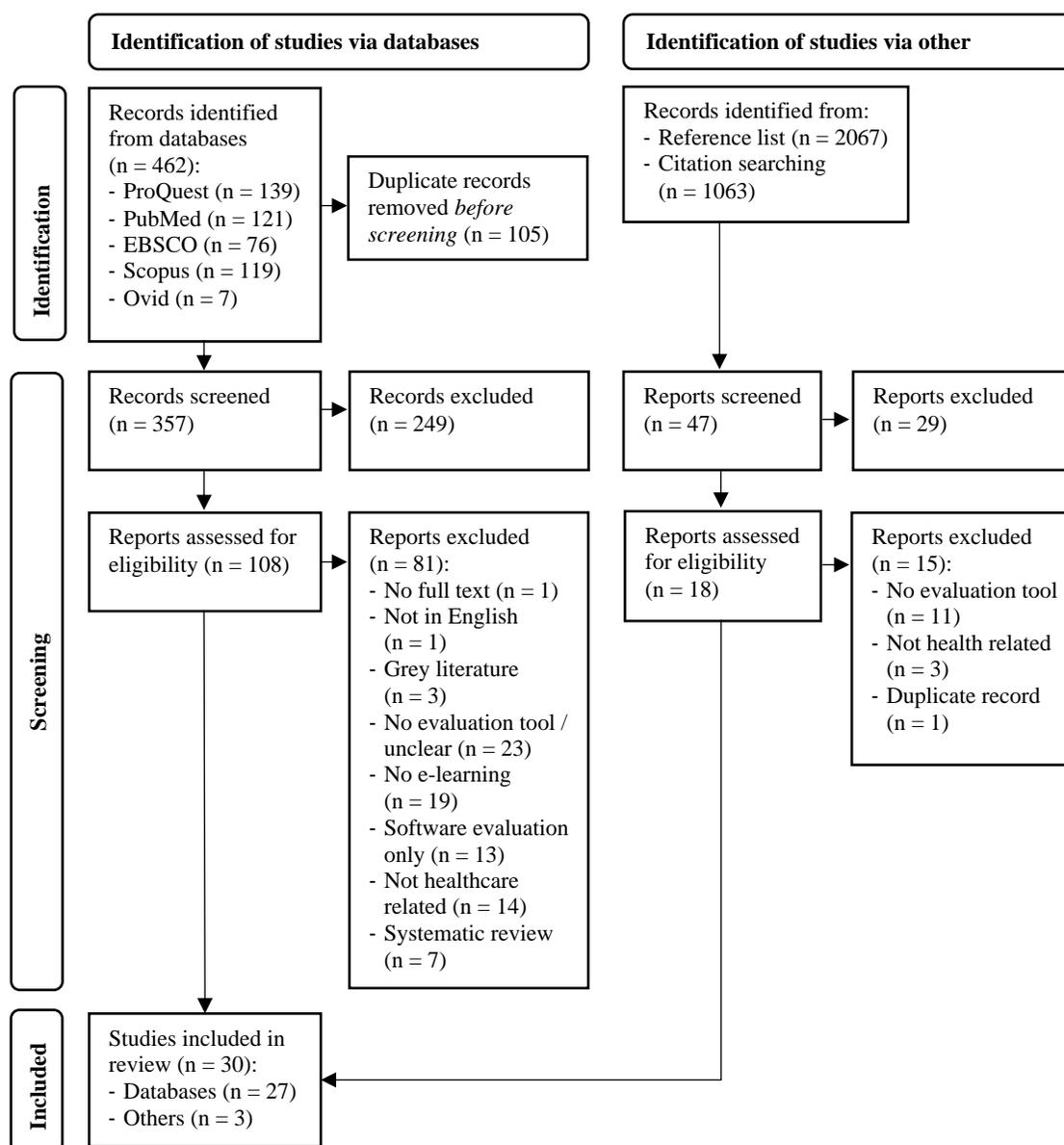
Data Extraction

Data were extracted into Microsoft Excel using a template designed by the reviewers (see Appendix A) that included the country in which the study was undertaken, study design, education setting, course, population, evaluation methods, limitation of evaluation component, and study design considerations. The data were extracted by the two reviewers, who independently identified emerging themes and then agreed upon the outcome.

Results

Study Characteristics

A total of 30 articles published between 2011 and 2021 were included in the final review (see Appendices A and B). The number of participants within studies ranged from 16 (Adwan, 2016) to 3,752 (Hegerius et al., 2020). The studies were from 16 different countries, with the most common from the United States (9 studies), followed by Spain (3 studies) and Canada (3 studies). One multinational study, based in Sweden, used data from 137 countries (Hegerius et al., 2020). Study specifications are summarized in Appendix B.

Educational Level

The education level of participants varied, with the majority of studies from continuing professional development (15), followed by undergraduate education (9), then a combination of undergraduate, postgraduate, and continuing education (3), postgraduate education (2), and one combination of undergraduate students and teaching staff (Garrett et al., 2013).

Discipline

Several studies specified the healthcare discipline of the student population, with the majority from medicine (10), followed by nursing (8), then pharmacy (2). Ohers were from multiple disciplines (6), and a small number were from nutrition (Heuberger et al., 2019), health research (Tannenbaum & van Hoof, 2018), health informatics (Adwan et al., 2016), and global health (Lee et al., 2020).

Educational Institution

Course delivery was online, with more than half facilitated by universities (16 or 53%), followed by hospitals (6) and then a combination of universities and health centers (6), one research center (Hegerius et al., 2020), one combination research center and university (Tannenbaum & van Hoof, 2018) and one council (Willman et al., 2016).

Study Designs

The majority of studies used quasi-experimental designs (14), followed by descriptive designs (9), randomized controlled trials (3), and mixed methods (2). Others included a case study (Peterson et al., 2016) and a qualitative study (Prosser et al., 2021).

Evaluation Methods

Methods for evaluating e-learning effectiveness were the focus of this review and are summarized in Table 3. This section describes the tools and methods that were used in the literature to assess learning effectiveness. The methods include student participation, student satisfaction, performance measures, and training models, among others.

Table 3

Summary of Evaluation Methods and Their Limitations

Examples	Limitations
Student participation	
The proportion of students who participated in and completed the course	Poor measurement of learning outcomes
	Participation does not explain learning platform usage
Class attendance records	Unable to explain student dropouts or participation rates during the course
System log data of students' interaction on the learning platform and participation in discussion forums	
Self-report questionnaire feedback that asks about participation	
Students' reaction to training program	
Reactions can be used during the course and at the end to evaluate student satisfaction	Poor measurement of learning outcomes and overemphasized use in the literature
	Difficulties obtaining adequate responses when conducted at the end of the course compared to mid-way through
Self-reported questionnaires using Likert-type scales and open-ended questions	Most questionnaires were designed for the course with no prior validation
It can also be obtained from focus groups	When questionnaires are made voluntary or little incentives were given, lower response rates and response biases occur
It can also measure students' acceptance of the learning platform	It does not allow updating of course delivery when courses were rated poorly if conducted at the end of the course
Often administered with incentives such as reminder emails and cash incentives	Unable to explain reasons behind course withdrawals and student satisfaction over time
Performance measures: Assessment of knowledge	
Measured knowledge acquisition in the form of assessments, exams and final grades	Difficulty determining knowledge acquisition from assessment and exam scores alone
	No justification between course pass rate and knowledge acquisition
Some studies used validated knowledge-based questions to measure course-specific changes in knowledge before commencement and at the end of the course (pre-test/post-test)	Lower response rates with post-test measures when they do not count towards final grades
	It does not measure the long-term impact of knowledge acquisition

Performance measures: Long-term or follow-up	
Measured knowledge transfer over time using follow-up questionnaires	Risks of low response rates when little incentives were given
Timeframes ranged from one month to four years after course completion, and some used multiple follow-up periods	Requires resources including time and money to conduct compared to no follow-up
Follow-ups were identified as the most useful tool to measure knowledge transfer after course completion	
Self-efficacy	
Typically uses pre-test/post-test self-report questionnaires, validated and non-validated	Poor measurement of learning outcomes
	Similar issues with other questionnaires, including low response rates and self-report bias
Used in combination with course evaluation and participation questionnaires	
The Kirkpatrick Model	
Well-researched evaluation model with three levels: Level 1: Reaction—satisfaction and self-efficacy questionnaires Level 2: Learning—knowledge-based assessments Level 3, Behavior—follow-up questionnaires Level 4, Result—use of workplace information system data, rarely measured	Most studies use some aspects of the model in terms of Levels 1 and 2, which are poor measurements of learning outcomes Often Levels 3 and 4 are not measured without rationale, which are more robust measures of learning performance Requires follow-up evaluations or access to workplace data that may be costly Does not measure return on investment Limited research into the utility of the model for online learning
Other methods	
Focus groups	No standard methodology for these tools
Written reflections	Requires resources including time and money to train staff in their use and conduct
Feedback for student performance	
Electronic portfolios	Feedback was only effective when delivered in real-time during the course and not after
Cost-effectiveness	Electronic portfolios were only used to evaluate clinical practice skills

Student Participation

A small proportion of studies measured participation using a variety of methods including class attendance (Lee et al., 2020), interaction with class discussion forums or completing class exercises (Adwan, 2016; Carrizosa et al., 2018; dos Reis et al., 2019; Salinas et al., 2017), obtaining learning platform analytic data (Reese et al., 2021; Wlodarczyk et al., 2017), and finally student evaluation about their participation experience (Figuccio, 2020; Liaw et al., 2016; Peterson et al., 2016). While participation data reflects student reactions, it does not evaluate learning effectiveness (Lima et al., 2019) and neglects to inform teachers of how students used online platforms (Backhouse et al., 2017). Carrizosa et al. (2018) further reported that while students were participating below staff expectations, the data could not provide reasons behind the participation rates.

Students' Reaction to Training Programs

Student reaction to the course is a subjective measure (such as students' self-reported satisfaction with the course) that is typically completed mid-way (formative) or towards the end of the course (summative). Less than half of the studies measured student reaction, or acceptance of pedagogy, using either of these methods (13; e.g., Adwan, 2016). Hegerius et al. (2020) measured students' acceptance of the information system or platform used to deliver the course. Evaluation tools that were delivered as formative (mid-way) studies were found to have higher response rates (e.g., 85%; Peterson et al., 2016), compared to summative evaluations that were completed towards the end of the course, which had lower response rates (e.g., 62.4%; Backhouse et al., 2017). Questionnaires were typically voluntary, and issues included low response rates, such as 13.2% (Hegerius et al., 2020), and some report high course dropout rates (dos Reis et al., 2019). Incentives included regular reminders using email (Hegerius et al., 2020) or by earning points that contributed to their final grades (Adwan, 2016). Studies attributed low response rates when participation in questionnaires was voluntary (e.g., Whitt et al., 2016). Peterson et al. (2016) identified the advantage of early evaluations, as poorly rated courses were able to respond quickly and make changes when questionnaires were conducted mid-way through the course.

Another limitation to these methods is the inability to explain the reasons behind course withdrawals (Reese, 2021) or to capture student satisfaction with the course over time (Tannenbaum & van Hoof, 2018). Evaluations that were conducted mid-way through the course were helpful in updating course delivery when courses were rated poorly. It was reported that qualitative, open-ended surveys provided varying degrees of information, from too little to too much information, and was the least useful aspect of the course evaluation (Le Marne et al., 2020). It was identified that when questionnaires are voluntary, there is a potential problem of selection bias between those who respond and those who do not (Hegerius et al., 2020). Poor response rates can also impact the reliability of the information from questionnaires (Garrett et al., 2013). Adwan (2016) used Google Docs to conduct the evaluations and reported issues with the useability of the information system by staff and security concerns with students.

Performance Measures: Assessment of Knowledge

Several studies used grades from assessment tasks and final exams on two or more occasions to assess student knowledge (7; e.g., Annan et al., 2020). However, these articles did not discuss the value of the metrics used in their assessments or exams. For example, participants had to pass an examination to complete the course by achieving 60 percent or more (Carrizosa et

al., 2018), while another used a 100 percent pass rate (Willman et al., 2018). Types of assessments varied from multiple-choice questions (e.g., Schulz-Quach et al., 2018; Whitt et al., 2016) to oral assessments (e.g., Elzainy et al., 2020). Electronic portfolios were another method designed to assess clinical practice (Garrett et al., 2013). While studies did not report the limitations or deficiencies of their grading systems, using portfolios to measure clinical competency raised student concerns around privacy and confidentiality (Garrett et al., 2013).

Studies also varied in the format and delivery of questionnaires to measure changes in knowledge. Tannenbaum and van Hoof (2018) used a self-report questionnaire to test students' knowledge after the course. However, the authors identified that the questionnaire had not been previously validated (2018). Studies included those with externally validated questionnaires to measure students' performance (e.g., Kemper, 2017; Willman et al., 2018) and studies which had validated their own questionnaires (e.g., Heuberger et al., 2019; Schulz-Quach et al., 2018). Some questionnaires were specific to their subject content, such as stroke assessment (Gorchs-Molist et al., 2020), drug dispensing (dos Reis et al., 2019), and seizure management (Le Marne et al., 2016) and others measured self-directed learning readiness (Gagnon et al., 2015; Reviriego et al., 2014). Finally, the study by Kemper (2017) focused on questionnaires specific to measuring mindfulness (refer to Table 3) but did not measure the long-term impact on the participants.

Pre-test/post-test designs were also used to measure students' knowledge (e.g., Salinas et al., 2017) and performance (e.g., Backhouse et al., 2017) before and after training. However, some studies reported high dropout rates in the post-test phase (Annan et al., 2020; dos Reis et al., 2019; Gagnon et al., 2015; Reese, 2021; Reviriego et al., 2014), while others reported difficulties in accurately measuring the long-term impact of knowledge acquisition (Backhouse et al., 2017).

Performance Measures: Long-term or Follow-up
Various studies used follow-up questionnaires, ranging from one month to four years after course completion. Follow-up questionnaires implemented at one month had a 78 percent response rate (Wlodarczyk et al., 2017), while others implemented at eight months achieved 67 percent (Salinas et al., 2017). Gorchs-Molist et al. (2020) reported multiple follow-up periods, including after 1–2 years (71% response rate) and 3–4 years (91% response rate). Several studies identified the need to follow-up participants but could not undertake this process (Le Marne et al., 2016; Liaw et al., 2016; Simonsen et al., 2014; Uden-Holman et al., 2014).

Kirkpatrick's Training Evaluation Model
Various articles identified the need for learning evaluation methods, such as Kirkpatrick's Training Evaluation Model (Kirkpatrick & Kirkpatrick, 2006). This model has four levels of training outcomes: Level 1 (reaction) measures student responses about the quality of training; Level 2 (learning) quantifies learning using assessments and exams; Level 3 (behavior) measures the extent to which learning can be applied to the workplace; and Level 4 (results) measures how training has impacted organizational goals (Bates, 2004). Six studies reported on Kirkpatrick's evaluation model. Single measures ranged from self-reported student satisfaction at Level 1 (Hegerius et al., 2020) to course completion at Level 3 (Reese, 2021). In addition, hospital information system data were used to determine changes in compliance rates for Level 3 and clinical outcomes for Level 4 (Gorchs-Molist et al., 2020; Liaw et al., 2016). Level 3 was also measured using a 6-month post-test evaluation (Uden-Holman et al., 2014). However, one study

reported improvements at Levels 1 and 2 but not at Levels 3 or 4 (dos Reis et al., 2019). Other studies identified in the review that did not use Kirkpatrick's model have inadvertently used elements from Kirkpatrick's model (e.g., reaction, learning, behavior, and outcomes).

Self-efficacy

Bandura's Conceptual Model of self-efficacy (Bandura, 1997), part of Level 2 of the Kirkpatrick evaluation model (Kirkpatrick & Kirkpatrick, 2006), were delivered using pre- and post-test methods and included a Likert-type scale design with a validated nine-item, ten-point scale (Aper et al., 2012); a non-validated three-item, ten-point scale (Tannenbaum & van Hoof, 2018); and a one-item, five-point scale (Reese, 2021). Schulz-Quach et al. (2018) identified the need to measure self-efficacy to improve methodological quality. However, the voluntary nature of these self-report questionnaires has had response rates as low as 60 percent (Whitt et al., 2016).

Other Methods

Other themes that emerged from the review were focus groups, reflections, and cost-effectiveness. Numerous studies within the review articles used focus groups. For example, focus groups using open-ended questions can examine learning experiences within the course (Garrett et al., 2013), while software such as FocusGroupIt can address themes using a SWOT (i.e., strengths, weaknesses, opportunities, threats) analysis (Elzainy et al., 2020). In contrast, Heuberger et al. (2019) conducted focus groups before their study and used the results to pilot and validate their course satisfaction survey. Furthermore, focus group transcripts and written reflections can be combined using thematic analysis to provide student feedback (Posser et al., 2021). However, the use of focus groups and reflections was impacted by the time requirements to train staff, and written reflections provided little additional information. Finally, formative feedback delivered to students in real-time has demonstrated success at commending high performers and encouraging low performers to improve their grades (Adwan, 2016).

Few studies reported the cost-effectiveness of the evaluation methods and their outcomes. Several studies reported the need for additional cost-effectiveness research (e.g., Kemper, 2017). Other studies commented on the cost savings of delivering training online instead of face-to-face (e.g., Martinez et al., 2019). While the cost-effectiveness of the evaluation methods was not always measured, some authors evaluated cost-effectiveness from self-perception scores, increase in knowledge and self-efficacy (e.g., Carrizosa et al., 2018).

Discussion

This rapid review identified research articles that used evaluation methods to measure the impact health-related online education has on student performance. When organizations are faced with emerging technology-driven changes and digital disruptors, as with the COVID-19 outbreak, there is a need for learning and development to support improvement in workplace performance. However, training and learning design and delivery methods need to be assessed to ensure education is efficient and relevant.

This is particularly important in assessing the change from traditional face-to-face delivery to online models for teaching and learning. This review attempts to summarize research in this area and provide actionable and relevant evidence to help organizations plan learning interventions and measure the impact of student performance over time.

What were the Evaluation Methods and their Limitations?

From this review, it is apparent there is no single method that comprehensively measures the impact of learning interventions. Based on the level of data obtained, tools ranged from self-report evaluations measuring participation rates and student's satisfaction to metric data such as course grades (and in health, very specific performance metrics related to clinical information system data e.g., changes to hospital length of stay) (Liaw et al., 2016). The distinct types of data collection were self-report questionnaires that used Likert-style scoring with or without open-ended questions; assessment tasks and exams that were scored on a grading system; and focus groups, reflections and portfolios that provided qualitative information and uncovered themes. There were also various applications of these tools, including before and after the course (e.g., using a pre-test/post-test approach), mid-way and at the end of the course (in a formative and summative approach), only at the end of the course (e.g., with final grades or course evaluations), and follow-ups after the course (e.g., six-month follow-up; Wlodarczyk et al., 2017; Carrizosa et al., 2018; Salinas et al., 2017; Gorchs-Molist et al., 2020). While available tools were used with a combination of students and teachers, the Kirkpatrick's evaluation method was the only complete framework described and used in some of the studies identified by the review (Hegerius et al., 2020; Reese, 2021; dos Reis et al., 2019; Gorchs-Molist., 2020; Liaw et al., 2016; den-Holman et al., 2014).

Several systematic reviews identified deficiencies with some of these evaluation methods, such as whether the use of non-validated measurement tools affected the validity of the outcomes or whether the training design affected student performance (Campbell et al., 2019; Moehead et al., 2020). Recommendations highlighted the need for validated frameworks to better synthesize learning effectiveness and a need for more robust study designs to enhance research methodologies (Barteit et al., 2020; Salter et al., 2014; Rouleau et al., 2019).

Which Tools are Appropriate for Measuring the Effectiveness of Online Education?

Given the limited evaluation methods and limitations with study designs (outlined in Table 3), caution is needed when assessing the utility of tools used. Nevertheless, the results suggest that using a framework, such as Kirkpatrick's, enables hierarchical measurement of learning effectiveness based on research-based findings. However, this involves using a collection of several types of evaluation tools, such as self-report questionnaires and comparing final grades, all with their own strengths and weaknesses.

Even though there is little evidence to suggest that e-learning has different outcomes to traditional face-to-face learning (Vaona et al., 2018), studies using Kirkpatrick's framework tended to limit the depth of learning effectiveness to Levels 1 and 2 and do not investigate how the course impacts performance in the workplace or over time.

While there are several explanations for limited evaluation, including the time and costs associated with measuring student performance, the following summary is a breakdown of tools and how they could be improved.

Participation Rates

Participation rates are the most straightforward metric used to measure student engagement. However, they provide little evidence about learning outcomes and fail to explain the reasons behind student dropouts. The use of self-report data could supplement information about dropouts and how these can be reduced in the future.

Self-Report Evaluation Tools

Self-reported course evaluation tools were found to be appropriate in obtaining students' experiences during the course and are best conducted early to allow time for the educators to adapt their teaching towards student preferences.

Furthermore, the use of teacher evaluation tools during the teaching enables more transparency within the teaching/class environment. Additionally, the use of validated course evaluation tools was found to be more robust than teacher-designed tools, providing more standardized results and allowing comparisons between classes (Barteit et al., 2020; Salter et al., 2014; Rouleau et al., 2019). Focus groups have also been used to validate evaluation questionnaires (Heuberger et al., 2019).

Knowledge Assessment

Assessments that are completed before, during and after the course (e.g., pre-test/post-test models and self-efficacy questionnaires) provided evidence of measuring learning effectiveness. Suggestions to enhance this method include the use of mandatory, or incentive-driven, delivery of these tools (e.g., grade incentives). This can help reduce the likelihood of nonresponse errors and self-selection bias. Validated subject-specific questionnaires are also recommended.

While mid-course assessments and final exams provide data about individual attainment, they fail to measure the long-term impact of the course (Backhouse et al., 2017; Kemper, 2017). One approach to measure this is the use of student follow-up questionnaires (Garrett et al., 2013), although they face the same responsiveness challenges of surveys.

Focus Groups and Written Reflections

Some studies used focus groups to obtain qualitative information about staff and student experiences from the course (Garrett et al., 2013). However, these were time-consuming and costly. Alternatives include written reflections which are less time-consuming to administer and provide a similar level of information (Prosser et al., 2021). Suggestions to improve written reflections were around incentives for completion (e.g., grade incentives), using validated methodologies (e.g., SWOT), providing real-time feedback (i.e., immediate versus delayed feedback), and capturing long-term data (e.g., post-course follow-up).

Recommendations

The majority of studies investigating the impact of online education programs did not consider a cost analysis or return on investment. This is important because the cost of one evaluation tool compared to another is an essential factor in the decision-making process around cost and benefit. Furthermore, an analysis of clinical significance was not performed in the majority of articles, as most outcomes were based on predefined goals such as achieving a pass mark (i.e., a 60+ percent score) or positive self-evaluation scores. Recommendations for future research are for more longitudinal studies that capture the effects of training after a six-month window and methods that can compare pre- and post-test outcomes.

Limitations

The rapid review process comes with several potential limitations, including the possibility that studies may have been missed (Tricco et al., 2017). This rapid review is not exhaustive, and as such, a search was not conducted on grey literature. The selected studies were from the academic research community and excluded evaluation methods within business and

private organizations other than hospitals and universities. Articles included in the analysis were limited to English, full-text studies, which may bias studies from high-income English language countries such as the United States and the United Kingdom, thus missing studies written in different languages. Further, the data extraction has been performed on learning interventions from training programs and did not consider evaluation methods available from education platforms (e.g., Learning Management System). The focal point of this rapid review was on learning outcomes and articles that only reported on technology acceptance were excluded. Furthermore, the purpose of the rapid review was to summarize evidence rather than evaluate effects, the evaluation of reported quantitative data from the studies were not the primary focus. Lastly, a critical appraisal was not performed and inter-rater reliability of selecting articles between the two reviewers was not measured, owing to the rapid nature of this review (Tricco et al., 2017). However, Table 3 includes a column that outlines the limitations mentioned within the identified studies.

Conclusion

This rapid review investigated the various methods and types of tools used to measure learning effectiveness for online education. The review included studies of online education within the discipline of healthcare and observed studies reporting positive effects of these training interventions. Education and development opportunities were identified as an important function that allows professionals to keep "up to date" with current practices. However, providing these opportunities within and across busy work schedules is complex. Although advancements in technology offer some alternatives on how professional development can be structured and organized, there is limited evidence to support what makes online teaching and learning effective. Many of the studies identified in this review suggest that professional development should provide support over a sustained period to achieve the most effective outcomes. However, due to constraints like funding, time, organizational structure, and policy, this is not often the case. Finally, while education evaluation tools and methods are popular in assessing the effectiveness of the training programs, the evidence suggests that using any evaluation method in isolation is insufficient. Suggestions were to adopt previously validated frameworks (not limited to the Kirkpatrick model) and appropriately implement them within the course curriculum. Developing a framework which identifies 'best practices' in the organization, development, delivery and evaluation of training can help support effective and sustainable education programs.

References

Adwan, J. (2016). Dynamic online peer evaluations to improve group assignments in nursing e-learning environment. *Nurse Education Today*, *41*, 67–72. https://doi.org/10.1016/j.nedt.2016.03.028

Ahmed, H., Allaf, M., & Elghazaly, H. (2020). COVID-19 and medical education. *The Lancet Infectious Diseases*, *20*(7), 777–778. https://doi.org/10.1016/S1473-3099(20)30226-7

Annan, R. A., Aduku, L. N. E., Kyei-Boateng, S., Yeun, H. M., Pickup, T., Pulman, A., Monroy-Valle, M., Ashworth-Hill, A., Jackson, A. A., & Choi, S. (2020). Implementing effective eLearning for scaling up global capacity building: Findings from the malnutrition elearning course evaluation in Ghana. *Global Health Action*, *13*(1). https://doi.org/10.1080/16549716.2020.1831794

Aper, L., Reniers, J., Koole, S., Valcke, M., & Derese, A. (2012). Impact of three alternative consultation training formats on self-efficacy and consultation skills of medical students. *Medical Teacher*, *34*(7), e500–507. https://doi.org/10.3109/0142159X.2012.668627

Australian Health Practitioner Regulation Agency. (2019, December 3). *Continuing professional development*. https://www.ahpra.gov.au/Registration/Registration-Standards/CPD.aspx

Backhouse, M., Fitzpatrick, M., Hutchinson, J., Thandi, C. S., & Keenan, I. D. (2017). Improvements in anatomy knowledge when utilizing a novel cyclical "Observe-Reflect-Draw-Edit-Repeat" learning process. *Anatomical Sciences Education*, *10*(1), 7–22. https://doi.org/10.1002/ase.1616

Bandura, A. (1997). *Self-efficacy: The exercise of control*. W. H. Freeman.

Barteit, S., Guzek, D., Jahn, A., Bärnighausen, T., Jorge, M. M., & Neuhann, F. (2020). Evaluation of e-learning for medical education in low- and middle-income countries: A systematic review. *Computers & Education*, *145*, 103726. https://doi.org/10.1016/j.compedu.2019.103726

Bates, R. (2004). A critical analysis of evaluation practice: The Kirkpatrick model and the principle of beneficence. *Evaluation and Program Planning*, *27*(3), 341–347. https://doi.org/10.1016/j.evalprogplan.2004.04.011

Campbell, K., Taylor, V., & Douglas, S. (2019). Effectiveness of online cancer education for nurses and allied health professionals: A systematic review using Kirkpatrick evaluation framework. *Journal of Cancer Education*, *34*(2), 339–356. https://doi.org/10.1007/s13187-017-1308-2

Carrizosa, J., Braga, P., Albuquerque, M., Bogacz, A., Burneo, J., Coan, A. C., Contreras, G., Guilhoto, L., Izquierdo, A., Ladino, L., Lin, K., Manreza, M. L., Morales, L., Rios, L., Solarte, R., Valente, K., Venegas, V., Uscategui-Daccarett, A., & Yacubian, E. M. (2018). Epilepsy for primary health care: A cost-effective Latin American E-learning initiative. *Epileptic Disorders*, *20*(5), 386–395. https://doi.org/10.1684/epd.2018.0997

Dhawan, S. (2020). Online learning: A panacea in the time of COVID-19 crisis. *Journal of Educational Technology Systems*, *49*(1), 5–22. https://doi.org/10.1177/0047239520934018

dos Reis, T. M., Baldoni, A. d. O., Campos, A. M., Girotto, E., Guidoni, C. M., Obreli-Neto, P. R., & Pereira, L. R. L. (2019). A distance-learning course to improve drug-dispensing behaviors among Brazilian community pharmacists. *American Journal of Pharmaceutical Education*, *83*(8), 1703–1711. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6900818/

Elzainy, A., El Sadik, A., & Al Abdulmonem, W. (2020). Experience of e-learning and online assessment during the COVID-19 pandemic at the College of Medicine, Qassim University. *Journal of Taibah University Medical Sciences*, *15*(6), 456–462. https://doi.org/10.1016/j.jtumed.2020.09.005

Figuccio, M. J. (2020). Examining the efficacy of e-service-learning. *Frontiers in Education*, *5*. https://doi.org/10.3389/feduc.2020.606451

Gagnon, J., Gagnon, M. P., Buteau, R. A., Azizah, G. M., JettÉ, S., Lampron, A., Simonyan, D., Asua, J., & Reviriego, E. (2015). Adaptation and evaluation of online self-learning modules to teach critical appraisal and evidence-based practice in nursing: An international collaboration. *CIN: Computers, Informatics, Nursing*, *33*(7), 285–294. https://doi.org/10.1097/CIN.0000000000000156

Garrett, B. M., MacPhee, M., & Jackson, C. (2013). Evaluation of an eportfolio for the assessment of clinical competence in a baccalaureate nursing program. *Nurse Education Today*, *33*(10), 1207–1213. https://doi.org/10.1016/j.nedt.2012.06.015

Gorchs-Molist, M., Sola-Munoz, S., Enjo-Perez, I., Querol-Gil, M., Carrera-Giraldo, D., Nicolas-Arfelis, J. M., Jimenez-Fabrega, F. X., & Perez de la Ossa, N. (2020). An online training intervention on prehospital stroke codes in Catalonia to improve the knowledge, pre-notification compliance and time performance of emergency medical services professionals. *International Journal of Environmental Research and Public Health*, *17*(17), 6183. https://doi.org/10.3390/ijerph17176183

Harzing, A. W. (2007). *Publish or Perish* (version 7). https://harzing.com/resources/publish-or-perish

Hegerius, A., Caduff-Janosa, P., Savage, R., & Ellenius, J. (2020). E-Learning in pharmacovigilance: An evaluation of microlearning-based modules developed by Uppsala Monitoring Centre. *Drug Safety*, *43*(11), 1171–1180. https://doi.org/10.1007/s40264-020-00981-w

Heuberger, R., & Clark, W. A. (2019). Synchronous delivery of online graduate education in clinical nutrition: An inquiry into student perceptions and preferences. *Journal of Allied Health*, *48*(1), 61–66. https://pubmed.ncbi.nlm.nih.gov/30826832

Huang, X., Lin, J., & Demner-Fushman, D. (2006). Evaluation of PICO as a knowledge representation for clinical questions. *AMIA Annual Symposium proceedings.* 359–363. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1839740/

Hughes, A. M., Gregory, M. E., Joseph, D. L., Sonesh, S. C., Marlow, S. L., Lacerenza, C. N., Benishek, L. E., King, H. B., & Salas, E. (2016). Saving lives: A meta-analysis of team training in healthcare. *Journal of Applied Psychology*, *101*(9), 1266–1304. https://doi.org/10.1037/apl0000120

Jayakumar, N., Brunckhorst, O., Dasgupta, P., Khan, M. S., & Ahmed, K. (2015). E-Learning in surgical education: A systematic review. *Journal of Surgical Education*, *72*(6), 1145–1157. https://doi.org/10.1016/j.jsurg.2015.05.008

Kemper, K. J. (2017). Brief online mindfulness training: Immediate impact. *Journal of Evidence-Based Complementary and Alternative Medicine*, *22*(1), 75–80. https://doi.org/10.1177/2156587216639199

Khan, R. A. G., Khan, F. A., & Khan, M. A. (2011). Impact of training and development on organizational performance. *Global Journal of Management and Business Research*, *11*(7). https://swsu.ru/sbornik-statey/pdf/8-Impact-of-Training-and-Development-on-Organizational-Performance.pdf

Kirkpatrick, D. L. (1994). *Evaluating training programs: The four levels* (vol. 1). Berrett-Koehler Publishers.

Kirkpatrick, J. D., & Kirkpatrick, D. (2006). *Evaluating training programs: The four levels*. Berrett-Koehler Publishers. https://search.alexanderstreet.com/view/work/bibliographic_entity%7Cbibliographic_details%7C2341903

Le Marne, F. A., McGinness, H., Slade, R., Cardamone, M., Balbir Singh, S., Connolly, A. M., & Bye, A. M. (2016). Evaluation of an e-learning resource on approach to the first unprovoked seizure. *Journal of Paediatrics and Child Health*, *52*(9), 896–900. https://doi.org/10.1111/jpc.13277

Lee, S. J., Park, J., Lee, Y. J., Lee, S., Kim, W. H., & Yoon, H. B. (2020). The feasibility and satisfaction of an online global health education course at a single medical school: A retrospective study. *Korean Journal of Medical Education*, *32*(4), 307–315. https://doi.org/10.3946/kjme.2020.178

Liaw, S. Y., Wong, L. F., Lim, E. Y., Ang, S. B., Mujumdar, S., Ho, J. T., Mordiffi, S. Z., & Ang, E. N. (2016). Effectiveness of a web-based simulation in improving nurses' workplace practice with deteriorating ward patients: A pre- and post-intervention study. *Journal of Medical Internet Research*, *18*(2), e37. https://doi.org/10.2196/jmir.5294

Lima, M. S., Tonial, F. G., Basei, E., Brew, M. C., Grossmann, E., Haddad, A. E., Rivaldo, E. G., Vargas, I. A., & Bavaresco, C. S. (2019). Effectiveness of the distance learning strategy applied to orthodontics education: A systematic literature review. *Telemedicine Journal and e-Health*, *25*(12), 1134–1143. https://doi.org/10.1089/tmj.2018.0286

Martinez, C., Castellano, Y., Andres, A., Fu, M., Feliu, A., Anton, L., Ballbe, M., Fernandez, P., Cabrera, S., Riccobene, A., Gavilan, E., Baena, A., Margalef, M., Tigova, O., Quiros, N., Guillen, O., Company, A., & Fernandez, E. (2019). Impact of an online training program in smoking cessation interventions in hospitals. *Journal of Nursing Scholarship*, *51*(4), 449–458. https://doi.org/10.1111/jnu.12469

Moehead, A., DeSouza, K., Walsh, K., & Pit, S. W. (2020). A web-based dementia education program and its application to an Australian web-based dementia care competency and training network: Integrative systematic review. *Journal of Medical Internet Research*, *22*(1), e16808. https://doi.org/10.2196/16808

Page, M. J., McKenzie, J. E., Bossuyt, P. M., Boutron, I., Hoffmann, T. C., Mulrow, C. D., Shamseer, L., Tetzlaff, J. M., Akl, E. A., Brennan, S. E., Chou, R., Glanville, J., Grimshaw, J. M., Hróbjartsson, A., Lalu, M. M., Li, T., Loder, E. W., Mayo-Wilson, E., McDonald, S., McGuinness, L. A., Stewart, L. A., Thomas, J., Tricco, A. C., Welch, V. A., Whiting, P., & Moher, D. (2021). The PRISMA 2020 statement: An updated guideline for reporting systematic reviews. *BMJ*, *372*, n71. https://doi.org/10.1136/bmj.n71

Peterson, J. L. (2016). Formative evaluations in online classes. *Journal of Educators Online*, *13*(1). https://doi.org/10.9743/JEO.2016.1.8

Pokhrel, S., & Chhetri, R. (2021). A literature review on impact of COVID-19 pandemic on teaching and learning. *Higher Education for the Future*, *8*(1), 133–141. https://doi.org/10.1177/2347631120983481

Prosser, M., Stephenson, T., Mathur, J., Enayati, H., Kadie, A., Abdi, M. M., Handuleh, J. I. M., & Keynejad, R. C. (2021). Reflective practice and transcultural psychiatry peer e-learning between Somaliland and the UK: A qualitative evaluation. *BMC Medical Education*, *21*(1), 58. https://doi.org/10.1186/s12909-020-02465-y

Reese, D., Dolansky, M. A., Moore, S. M., Bolden, H., & Singh, M. K. (2021). Quality improvement education innovation: Evaluation of Coursera MOOC "Take the Lead on Healthcare Quality Improvement." *Journal of Research in Nursing*, *26*(1–2), 62–78. https://doi.org/10.1177/1744987120982644

Reviriego, E., Cidoncha, M. A., Asua, J., Gagnon, M. P., Mateos, M., Garate, L., de Lorenzo, E., & Gonzalez, R. M. (2014). Online training course on critical appraisal for nurses: Adaptation and assessment. *BMC Medical Education*, *14*, 136. https://doi.org/10.1186/1472-6920-14-136

Rouleau, G., Gagnon, M. P., Cote, J., Payne-Gagnon, J., Hudson, E., Dubois, C. A., & Bouix-Picasso, J. (2019). Effects of e-learning in a continuing education context on nursing care: Systematic review of systematic qualitative, quantitative, and mixed-studies reviews. *Journal of Medical Internet Research*, *21*(10), e15118. https://doi.org/10.2196/15118

Salas, E., Tannenbaum, S. I., Kraiger, K., & Smith-Jentsch, K. A. (2012). The science of training and development in organizations: What matters in practice. *Psychological Science in the Public Interest*, *13*(2), 74–101. https://doi.org/10.1177/1529100612436661

Salinas, J., Munoz, C., Albagli, A., Araya, G., & Vio, F. (2017). The contribution of distance education to health promotion in Chile. *Health Promotion International*, *32*(5), 913–921. https://doi.org/10.1093/heapro/daw023

Salter, S. M., Karia, A., Sanfilippo, F. M., & Clifford, R. M. (2014). Effectiveness of e-learning in pharmacy education. *American Journal of Pharmaceutical Education*, *78*(4), 83. https://doi.org/10.5688/ajpe78483

Schulz-Quach, C., Wenzel-Meyburg, U., & Fetz, K. (2018). Can elearning be used to teach palliative care?—medical students' acceptance, knowledge, and self-estimation of competence in palliative care after elearning. *BMC Medical Education*, *18*(1), 82. https://doi.org/10.1186/s12909-018-1186-2

Simonsen, B. O., Daehlin, G. K., Johansson, I., & Farup, P. G. (2014). Improvement of drug dose calculations by classroom teaching or e-learning: a randomised controlled trial in nurses. *BMJ Open*, *4*(10), e006025. https://doi.org/10.1136/bmjopen-2014-006025

Tannenbaum, C., & van Hoof, K. (2018). Effectiveness of online learning on health researcher capacity to appropriately integrate sex, gender, or both in grant proposals. *Biology of Sex Differences*, *9*(1), 39. https://doi.org/10.1186/s13293-018-0197-3

Tricco, A. C., Langlois, E. V., & Straus, S. E. (2017). *Rapid reviews to strengthen health policy and systems: A practical guide*. World Health Organization. https://www.who.int/alliance-hpsr/resources/publications/rapid-review-guide/en/

Uden-Holman, T., Bedet, J., Walkner, L., & Abd-Hamid, N. H. (2014). Adaptive scenarios: A training model for today's public health workforce. *Journal of Public Health Management and Practice*, *20 Suppl 5*, S44–48. https://doi.org/10.1097/PHH.0000000000000067

United Nations. (2020). *Policy brief: Education during COVID-19 and beyond.* https://www.un.org/development/desa/dspd/wpcontent/uploads/sites/22/2020/08/sg_policy_brief_covid-19_and_education_august_2020.pdf

Vaona, A., Banzi, R., Kwag, K. H., Rigon, G., Cereda, D., Pecoraro, V., Tramacere, I., & Moja, L. (2018). E-learning for health professionals. *Cochrane Database of Systematic Reviews*, 8. https://doi.org/10.1002/14651858.CD011736.pub2

Veritas Health Innovation. (2019). *Covidence systematic review software*. https://www.covidence.org

Whitt, K. J., Macri, C., O'Brien, T. J., & Wright, S. (2016). Improving nurse practitioners' competence with genetics: Effectiveness of an online course. *Journal of the American Association of Nurse Practitioners*, *28*(3), 151–159. https://doi.org/10.1002/2327-6924.12282

Willman, B., Grankvist, K., & Bolenius, K. (2018). Evaluation of the clinical implementation of a large-scale online e-learning program on venous blood specimen collection guideline practices. *Clinical Chemistry and Laboratory Medicine*, *56*(11), 1870–1877. https://doi.org/10.1515/cclm-2018-0051

Wlodarczyk, D., Chylinska, J., Lazarewicz, M., Rzadkiewicz, M., Jaworski, M., Adamus, M., Haugan, G., Lillefjell, M., & Espnes, G. A. (2017). Enhancing doctors' competencies in communication with and activation of older patients: The Promoting Active Aging (PRACTA) computer-based intervention study. *Journal of Medical Internet Research*, *19*(2), e45. https://doi.org/10.2196/jmir.6948

Zafar, S., Safdar, S., & Zafar, A. N. (2014). Evaluation of use of e-Learning in undergraduate radiology education: A review. *European Journal of Radiology*, *83*(12), 2277–2287. https://doi.org/10.1016/j.ejrad.2014.08.017

Appendix A
Characteristics of Included Studies

First Author Year Country	Study design Intervention	Setting Course Population Sample size	Evaluation methods	Limitations of evaluation methods	Study limitations or recommendations
Adwan 2016 USA	Delayed feedback versus immediate feedback.	University Health informatics Undergraduate students n = 16	Course evaluations (Questionnaires) and performance (Final assessment grade).	Nonstandard scale used. Bias from scale with high rated self-report scores. Use of Google Docs unfamiliar with some staff. Security concerns with survey platform.	High dropout rate. Groups were formed based on peer groups.
Annan 2020 Ghana	Compares four course delivery methods	University Malnutrition e-learning course Undergraduates n = 931	Pre- and post-test assessments, self-reported questionnaires, and course completion.	Self-reported course completion, limitations for the other evaluation techniques were not mentioned.	Low post-study participation rate. No significant improvement between pre- and post-assessments were found.
Aper 2012 Belgium	Three course delivery methods	Online training Medical student competencies Postgraduates n = 186	Self-efficacy was measured using a validated questionnaire. Competencies measured by examining assessment responses.	The quality of students' performance was not measured.	Longer studies are recommended to study long-term impacts of the alternative training formats. Suggest that a qualitative study may help to validate results. Future studies could also focus on the long-term development of the leaning outcomes.
Backhouse 2017 UK	Pre-test/post-test design comparing online and face-to-face	University Anatomy (medicine) Undergraduate n = 209	Performance, Student perceptions student test scores Self response survey measuring - timing, delivery, guidance, technical, others.	Evaluations tools did not identify how students used the online platform and how they engaged with the activities. Long-term impact of knowledge acquisition was also not measured.	The differences between the two methods—online and face-to-face were discussed as limitations for comparing the findings. Evaluate student use of the teaching method.

Carrizosa 2018 Uruguay	Pre-test/post-test design Evaluation of an e-learning course	Moodle Epilepsy training Primary care physicians n = 105	Participation (forum contributions), course completion (final grades), course evaluation (questionnaires), cost-effectiveness (student investment), long-term learning (questionnaires after 6-months).	Participation in forums were below staff expectations and overlapped other modules for some students due to the short duration of each module, thus students may not have benefited from this tool.	No limitations or bias discussed.
dos Reis 2019 Brazil	Pre-test/post-test evaluations of an e-learning course	Moodle Drug-dispensing Pharmacists n = 472	Course effectiveness used Kirkpatrick's model levels 1 to 3. Participant satisfaction (5-item questionnaire), learner outcomes (pre-post-test), performance improvement (simulated practice). Patient or health outcomes (level 4) was not measured.	There were positive results obtained from Kirkpatrick's levels 1 (satisfaction) and 2 (knowledge) analyses. No improvement occurred in the conduct (level 3) of the skills and abilities assessed in simulated dispensing practice.	High level of dropouts, authors suggest higher course fees may reduce the level of dropouts. Mystery shopper technique minimized bias. Educational strategies may address the lack of practical activities in distance learning.
Elzainy 2020 KSA	Compares face-to-face learning and online	University Various medical courses Undergraduates n = 250	Final assessment scores, student satisfaction survey, weekly staff perception reports, and staff learning experiences (focus groups).	None discussed.	No limitations or bias discussed.
Figuccio 2020 USA	Compares face-to-face learning and online	University Atypical Development Undergraduates n = 58	Student experience (end-of-course questionnaire), course evaluations (questionnaire), student reflection papers (coded by tutors).	None discussed.	No limitations or bias discussed.

Gagnon 2015 Canada, Spain	Pre-test/post-test design	University Critical appraisal Nurses n = 86	Various questionnaires (knowledge acquisition, self-directed learning readiness, and satisfaction with training program).	None discussed.	Lack of control and randomization. High dropout with no reason for withdrawing from course.
Garrett 2013 Canada	Effect of and e-portfolio on clinical skills	University Science in nursing Students, n = 36 Staff, n = 18	Clinical placement experience (portfolios), LMS use analytics, instructor / student surveys, and focus groups.	Differences in instructor use of the assessment tools (access to portfolio during assessments). Poor return of questionnaires.	Small sample size and smaller. Issues with data transparency from portfolio's (suggest restricting access during assessments).
Gorchs-Molist 2020 Spain	Pre-test/post-test evaluations of an e-learning course	Hospital Stroke assessment Medical professionals n = 30	Kirkpatrick's model levels 1 to 4: 1, satisfaction survey. 2, pre-post knowledge test. 3, compliance rates with clinical system. 4, proportion of codes and prehospital care times.	Data collected was limited to prehospital setting, so effectiveness data post clinical care remains unknown. Unable to capture data on the clinical outcome of the patients.	Data collected was limited to prehospital setting, so clinical significance not directly measured. Future studies should seek to include further in-hospital clinical variables.
Hegerius 2020 Sweden, multinational	Evaluation of an online course	Research center Pharmacovigilance Health professionals n = 3752 from 137 countries	E-Learning evaluation as overall satisfaction (Kirkpatrick's evaluation model level 1). Use of LLMS system (survey and logged usage data).	No measure of the impact and cost effectiveness of the training. Low response rate may have come from a delay in post-course survey. Addressed the selection bias from those who responded to surveys compared to those who did not.	Results may not be relevant to other learning fields. Recommendations to evaluate knowledge to determine if there was any behavior change after course.
Heuberger 2019 USA	Satisfaction of synchronous and asynchronous learning	University Clinical nutrition Master's students n = 176	Evaluate student satisfaction for courses delivered in synchronous and asynchronous modes using open-ended surveys and focus groups.	None discussed.	Future research suggestions were continuing to gauge student preferences for satisfaction with the emerging education technologies.

Kemper 2017 USA	Improvements in course outcomes	Health center Mindfulness training Health professionals n = 146	10-item Cognitive and Affective Mindfulness Scale–Revised (CAMS-R) 15-item Mindful Attention Awareness Scale (MAAS) 39-item Five Facet Mindfulness Questionnaire (FFMQ).	Did not measure long-term impact and cost-effectiveness.	Unable to be generalized since there was no randomization, was conducted at one institution, and course training was voluntary.
Le Marne 2020 Australia	Pre-test/post-test evaluations of an e-learning course	Hospital Pediatric seizures Medical specialists n = 50	Performance from assessment scores Course satisfaction open-ended survey Self-rated clinical knowledge and self-efficacy.	The level of detail from self-reported qualitative feedback varied between extremes of too little information or too much detail and was reported as least useful aspects of evaluating the course.	Suggests for longitudinal follow-up to determine transference of knowledge into clinical practice of management of pediatric seizures.
Lee 2020 South Korea	Compares face-to-face learning and online	University Global health Undergraduates n = 146	Participation rate Satisfaction of the course Student preferences online and face-to-face Academic achievement.	Difficulty making comparisons with final exams scores between two years since exams differed in content and delivery. Limitations for other outcome measures not mentioned	Not generalizable to all medical students since the course was targeted at second year students at one medical institution. Written final exams scores were incomparable.
Lesser 2019 USA	Pilot study of different songs and analysis of user data	University Introductory statistics Undergraduate n = 77	Student performance from course assessment Learning system usage from analysis of log records.	None discussed.	Recommends introducing student feedback to improve completion of tasks. Implementing randomized controlled trials to compare performance under varied treatment conditions.
Liaw 2016 Singapore	Pre-test/post-test evaluations of an e-learning course	Hospital Deteriorating patients Ward nurses n = 99	Increase in knowledge from post-test scores Perceived attitudes to learning transfer Hospital length of stay from cohort workplaces Evaluation of course was guided by Kirkpatrick's evaluation model.	Unable to evaluate the effect of patient outcomes beyond the scope of the study.	Chance of missing other mitigating factors since results were analyzed based on documented outcomes. Lack of a control group to improve robustness of study outcomes.

Martinez 2019 Spain	Pre-test/post-test evaluations of an e-learning program	Hospital Tobacco intervention Hospital clinicians n = 127	Comparison of pre-post self-reported questionnaire of 63-items on a 10-point discrete scale internal reliability, a = 0.77.	None mentioned, however, the timing of the delivery of post-evaluation questionnaires would be important to consider clinical significance of the study. Focus was on the self-reported use of the intervention rather than success of program.	Focus was on the success of clinicians implementing the techniques and not the success of the program. Lack of comparison group. Results relied on self-reported responses. The sample were mainly female (85.7%), registered nurses (63%) and 45.7% had never smoked with physicians accounting for 7.9% of the sample size.
Peterson 2016 USA	Case study analysis of two online courses	University Medical terminology and pathophysiology Undergraduates n = 55	Open ended evaluations delivered at first half and at the end of the course, student performance measures (course assessments and exam grades).	Students did not use the feedback from the second evaluation, which was designed to inform them about improvements. The second course, pathophysiology, was rated poorly and received many complaints. It was decided to continue the course face-to-face.	Limitations were the short time frame to transition the face-to-face course to the online format.
Prosser 2021 UK, Somaliland	Thematic analysis of post-program in reflective writing	University Clinical cases (psychiatry) Medical students n = 33	Thematic analysis of written reflections and post-program focus groups.	Program and thematic analysis was conducted in English which was not the primary language spoken with participants from Somaliland.	Unable to evaluate the 27% of participants who dropped out of the program.
Reese 2021 USA	Pre-test/post-test evaluations of an e-learning course	Healthcare quality improvement Self-selected learners n = 88	Uses Kirkpatrick's model Levels 1 to 3 to evaluate satisfaction, learning outcomes, and knowledge.	No data from participant withdrawals from course, heavy evaluation burden placed on learners, embedded evaluations may have contributed to increased dropout rates.	Longitudinal analysis suggested for future studies to examine learning sustainability and behavior change outcomes.
Reviriego 2014 Spain	Pre-test/post-test evaluations of an e-learning course	Hospital Critical appraisal Nurses n = 50	Questionnaires to measure knowledge, satisfaction, and self-learning ability.	Identified that some participant dropouts were due to difficulty of content within the course.	Limitations were a lack of control group and random assignment. Small sample size. Difficulty determining success or failure of course.
Salinas 2017 Chile	A quali-quantitative evaluation	University Primary healthcare Postgrad course, n = 162 Technician course, n = 172	Evaluation of learning measured by participation and assessment task Program evaluation using pre-post and follow-up surveys.	None discussed.	No limitations or bias discussed.

Schulz-Quach 2018 Germany	Descriptive proof of concept study	University Palliative care Medical students n = 670	Evaluates the acceptance of eLearning and self-efficacy using a questionnaire Learning from exam of palliative care competencies.	Standard limitations from questionnaire-based evaluation.	No baseline measurements in palliative care prior to the eLearning course.
Simonsen 2014 Norway	Randomized controlled parallel design	Hospital Medication calculations Nurses n = 183	Knowledge on medication calculations using an exam. Questionnaires to evaluate the course (perceived difficulty of the course, learner satisfaction, usefulness of course).	None discussed.	Controlled test conditions may be regarded as a limitation (reflective of real-life clinical environment). Higher dropout in online course compared to face-to-face course.
Tannenbaum 2018 Canada	Pre-test/post-test evaluations of an e-learning course	Various Sex and gender science Research staff n = 543, 463, 435	Pre- and post-questionnaires to measure knowledge, self-efficacy, and self-reported behavior change intent.	Knowledge questions were not previously validated. Behavioral intent was self-reported and not indicative of actual changes in behavior, assessments were directly after completion of course and may not capture effects over time.	Participants were recruited via email and may have led to enrolment of a biased sample of researchers already interested in the course.
Uden-Holman 2014 USA	Descriptive design to evaluate two adaptive scenarios	University Psychological First Aid Public health personnel n = 112	Unspecified evaluation data on user satisfaction, content relevancy, and knowledge (Kirkpatrick's model Level 1).	None discussed.	Future recommendations include conducting a follow-up evaluation that addresses Kirkpatrick's level III, which measures transfer of learning within the work setting.
Whitt 2016 USA	Pre-test/post-test evaluations of an e-learning course	University Genetics course Nurse Practitioner students n = 140	5-point Likert scale, 65-item self-report pre-test/post-test survey measuring genetic competence and confidence plus a 21-item pre-post course multiple choice test to measure knowledge of genetics.	Measurement of genetic competencies were self-reported and not objectively measured and did not evaluate student outcomes relating to other areas such as legal, social, leadership or research.	Students were obtained from a single university and therefore not generalizable. Only 60 per cent of students responded to surveys. Finally, only an online course was evaluated, suggestions for a comparative studding face-to-face.

Willman 2018 Sweden	Course outcomes compared across groups over time	County Council Venipuncture Various technicians n = 879	Venipuncture skills questionnaire and pre-post course evaluation survey. Short answer questions (qualitative content analysis).	None discussed, the venipuncture questionnaire was previously validated. Information was not provided on number of students who failed compared to those who passed the course.	Poor participation rates over time. Future research on follow-up participants' practices and educational program efficiency.
Wlodarczyk 2017 Norway	Random assignment and control group	Primary Care facilities Active Aging General Practitioners n = 225	Self-reported scales administered on course completion and at 1-month follow-up: Communication Scale, Patients Expectations Scale, Scale, Attitude Toward Treatment and Health Scale, and Self-Efficacy Scale.	Outcome variables were self-reported.	There were unsatisfactory power sample calculations as most facilities approached declined to participate and there was more dropout rates during the progress of the study. Recommendations to consider eLearning satisfaction among doctors.

Appendix B
Tabulated List of Included Studies (n = 30)

First author	Year	Country	Study design	Sample size	Institution	Study level	Discipline	Evaluations
Adwan	2016	USA	Descriptive	16	U	UG	HI	P, RE, F
Annan	2020	Ghana	Descriptive	931	U	UG	V	K
Aper	2012	Belgium	RCT	186	U	PG	M	K, SE
Backhouse	2017	UK	Quasi-experimental	209	U	UG	M	K
Carrizosa	2018	Uruguay	Descriptive	105	U, HC	CPD	M	P, RE, K, CE
dos Reis	2019	Brazil	Quasi-experimental	472	U, HC	CPD	PH	P, RE, K, KM
Elzainy	2020	KSA	Quasi-experimental	250	U	UG	M	RE, K, FG
Figuccio	2020	USA	Quasi-experimental	58	U	UG	SW	P, RE
Gagnon	2015	Canada, Spain	Quasi-experimental	86	U	CPD	N	RE, K
Garrett	2013	Canada	Mixed methods	18	U	UG, T	N	RE, K, FG
Gorchs-Molist	2020	Spain	Quasi-experimental	30	HO	CPD	V	K, FU, KM
Hegerius	2020	Multinational	Descriptive	3752	R	CPD	PH	RE, KM
Heuberger	2019	USA	Descriptive	176	U	PG	N	K
Kemper	2017	USA	Descriptive	146	HC	CPD	V	K
Le Marne	2020	Australia	Quasi-experimental	50	HO	CPD	M	K, FU
Lee	2020	South Korea	Quasi-experimental	146	U	UG	GH	P, RE
Liaw	2016	Singapore	Quasi-experimental	99	HO	CPD	N	P, FU, KM
Martinez	2019	Spain	Quasi-experimental	127	HO	CPD	V	RE
Peterson	2016	USA	Case study	55	U	UG	M	P, RE
Prosser	2021	UK, Somaliland	Qualitative	33	U	UG	M	FG, RF
Reese	2021	USA	Descriptive	88	U, HC	CPD	N	P, K, KM, SE
Reviriego	2014	Spain	Quasi-experimental	50	HO	CPD	N	K
Salinas	2017	Chile	Mixed methods	334	U	PG, CPD	N	P, K, FU
Schulz-Quach	2018	Germany	Descriptive	670	U	UG	M	K
Simonsen	2014	Norway	RCT	183	HO	PG, CPD	N	RE, FU
Tannenbaum	2018	Multinational	Quasi-experimental	543	U, R	CPD	HR	K, SE
Uden-Holman	2014	USA	Descriptive	112	U	CPD	V	RE, FU, KM
Whitt	2016	USA	Quasi-experimental	140	U	PG, CPD	N	K, SE
Willman	2018	Sweden	Quasi-experimental	879	C	CPD	V	K
Wlodarczyk	2017	Norway	RCT	225	HC	CPD	M	P, FU

Note. C = county council; CE = cost-effectiveness; CPD = Continuing Professional Development; F = feedback; FG = focus groups; FU = follow-up; GH = global health; HC = health center; HI = Health Informatics; HO = hospital; HR = health research; K = knowledge; KM = Kirkpatrick model; M = medicine; N = nursing; NT = nutrition; P = participation; PH = pharmacy; R = research center; RCT = Randomized Controlled Trial; RE = reaction; RF = reflections; SE = self-efficacy; SW = Support Work; T = teachers and instructors; U = University; UK = United Kingdom; USA = United States of America; V = various disciplines; KSA = Kingdom of Saudi Arabia.

Using LMS Log Data to Explore
Student Engagement with Coursework Videos

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Abstract

Driven by the increased availability of Learning Management System data, this study explored its value and sought understanding of student behaviour through the information contained in activity level log data. Specifically, this study examined analytics data to understand students' engagement with online videos. Learning analytics data from the Moodle^{TM} and Vimeo® platforms were compared. The research also examined the impact of video length on engagement, and how engagement with videos changed over the course of a semester when multiple video resources were used in a course. The comparison in platform learning analytics showed differences in metrics thus offering a caution to users relying on unidimensional metrics. While the results support the notion that log data do provide educators with an opportunity for review, the time and expertise in extracting, handling, and using the data may stifle its widespread adoption.

Keywords: Video, higher education, LMS, learning analytics, student engagement

One of the most significant debates in higher education today is the motivation and use of Leaning Analytics (LA). On the one hand, the almost ubiquitous use of Learning Management Systems (e.g., Brightspace® by D2L, Moodle™, and Blackboard®), to deliver online learning content results in a data harvesting opportunity that could be used to inform teaching and learning. After all, a lack of knowledge about the ways that students interact with learning materials has been identified (Marks, et al, 2016). On the other hand, the fear of misuse of LA for the purpose of institutional surveillance and control gives cause to question the danger of its use and its value in ensuring inclusive educational spaces for learning (Selwyn, 2020; Green, 2018; Keyes, 2019). Caught in the middle are academics navigating new institutional expectations while bringing to bear their own optimism (or pessimism) regarding what the new tool has to offer. A scan of education journals reporting on its use signals that, generally, academics are buoyed by LA claims that, through the collection and analysis of the digital records of students and their interactions with various computer systems, they could better understand and optimise student learning and the environments in which it occurs (Axelsen, et al., , 2020; Marks et al., 2016). A good example is Harindranathan and Folkestad (2019) who demonstrate a meaningful use of LA data in an unsupervised, technology-enhanced platform. However, academics are cautious of the reported time and expertise needed to successfully make use of what LA has the potential to offer (Shibani, et al, 2020). A review of the literature by Panigraphi et al. (2018) indicate the wide spectrum of platforms used across the global e-learning sector.

Despite this debate, pressure on academics to evidence ongoing improvement continues. In online higher education, this proof of improvement relies on student data related to assessment performance and online content use, and confirmation that a feedback loop was created for the improvement of curriculum and the way online learning resources are designed. Kollom et al. (2021) indicate that academics do recognise the possibilities to influence the learning landscape using LA but warn of their reluctance to act on such data, especially with respect to at risk students. While some learning analytics research has focused on using analytics to evaluate courses to improve design (Pardo et al, 2015; Rienties et al,, 2015), little research has focused on continuous improvement of content using learning analytics at the activity (or course resource) level (Bodily et al,, 2017). In relation to the data generated by LMS, log data from these systems are often available for extraction, making these systems a potential source of activity-level data to study student learning using LA. Log data are a record of a user's activity within a system, including click or page view counts, time spent on a given action, keyboard strokes, results of an activity (such as performance on a quiz), and counts of any other activity that may occur within a system. Log data are an activity-level measure, capturing real-time changes in user interactions with the online learning system (Henrie, et al., 2018).

Despite the potential use of LMS data to inform online educational practices and design, researchers have suggested that further work is needed to understand how the value and meaning of LMS log data may best be applied to understanding, informing, and optimising teaching and learning practice (Henrie et al., 2018; Poon et al., 2017). To contribute to discussions in this area, the aims of the research reported in this paper were twofold: (1) examine the value and sufficiency of LMS log data for measuring student engagement at the activity-level, and (2) examine how log data may be used to better understand student engagement at the activity-level to thus inform and optimize how certain course resources/activities are designed.

Within the literature, educational video recordings are widely recognised as an effective pedagogical strategy to support student learning (Noetel et al., 2021; Brame, 2016). Given this, data were collected and analysed in relation to students' access to, and engagement with, course-specific videos (short video recordings developed and designed to support a particular learning focus within a course). Thus, to LMS log data at the activity-level, the "activity" examined was the way students engaged with the course videos available to learners.

Student engagement is often linked to the time, energy, and effort students dedicate to their learning and learning community (Bond, et al, 2020; Krause, 2005). This study accepted that student engagement is not static, can change during the semester, and occurs along a continuum (Muir et al., 2019). To this end and for the purposes of this study, student engagement is defined as the active choice to access, load, and view course videos as captured by LMS data.

To explore the value and sufficiency of LMS data (aim 1), data on student engagement with, or access to, the course videos were captured using two platforms: the LMS and Vimeo® (a video hosting platform). Examining the types of data available on the two platforms and considering how this data differed in relation to measuring student engagement with the video resources enabled the authors to assess the value and sufficiency of LMS data for this purpose. To understand how log data may be used to better understand student engagement at the activity-level and thus inform the design of course resources/activities (aim 2), the more detailed log data collected through Vimeo® analytics were analysed to examine how students engaged with/accessed the video resources. The purpose was to explore the usefulness of LMS data to further our understanding of *how* students engage with short video content. Relevant to this, although not the focus of this research, is what makes an instructional video effective for student learning. Video effectiveness may affect student engagement and what is of interest in this study is whether the LMS data can be of value in assessing this. For coverage of what makes an instructional video effective there is extensive research (Brame, 2016; Carmichael et al., 2018; Guo et al., 2014; Sherer & Shea, 2011), and for a discussion of the student experience see Alfayez (2021). The focus here was on the value of existing LMS analytic data to a course teaching team. The need for research to understand this is a precursor for fully embracing the potential of smart learning analytics (Giannakos et al., 2016).

Using Log Data to Analyse Engagement-Across various educational settings, student engagement has long been viewed as a factor that drives learning and predicts academic, social, and emotional learning outcomes (Fincham, et al., 2019), while lack of engagement has been identified as a contributor to lower completion rates in online learning courses (Kizilcec et al., 2013). Although student engagement is important to any learning experience, it is particularly relevant to technology-mediated learning (Henrie et al., 2018). Knowing what promotes or discourages engagement in technology-mediated learning is therefore important for ensuring that online learning resources are designed to keep students connected with the course and their learning (Dixson, 2015).

The metrics used to measure student engagement in online learning environments broadly align with those used in more traditional classroom settings. These include the time spent on course activities and use of resources (e.g., viewing pages, completing quizzes and assignments), course attendance (or number of logins), the accuracy and completion rate on quizzes and assignments, social interactions, and artifacts produced by learners (Fincham et al., 2019; Vytasek et al., 2020). The literature on engagement and learning analytics have primarily sought to examine student engagement through unidimensional quantitative data metrics, such as

discussion forum participation, watching video lectures, completing course assessments, and number of time resources or e-learning tools were used (e.g. Dixson, 2015; Karaksha et al., 2013; Li et al , 2015; Stewartet al., 2011; Vytasek et al., 2020). For student engagement with educational videos, watch time—or the median of normalized engagement time (i.e., the percentage of watch time from the total video)—has been the main measure for quantifying engagement in the literature (Bulathwela et al. , 2020; Guo et al., 2014; Wu et al., 2018).

Learning management systems accumulate vast volumes of data on student behaviour that can be used to inform and improve online student engagement and, as such, a growing body of research has explored the value of LMS log data (Beer et al., 2010; Brozinaet al., 2019; Casey & Azcona, 2017; Gašević, Dawson, & Siemens et al., 2015; Gašević, Mirriahi, Long, & Dawson, 2014; Henrie et al., 2018; Ismail et al., 2019; Macfadyen & Dawson, 2010). While much of this attention has focused on the relationship between log data (i.e., frequency of student LMS use, such as logins, discussion board use, resources used, etc.) and academic performance, there is increasing interest in the relationship between log data and student engagement outcomes. Researchers have examined, for example, the influence of LMS on student engagement (Venugopal & Jain, 2015; Williams & Whiting, 2016), the effects of LMS interface, design, and functionality on online student engagement (Barua et al., 2018; Jordon & Duckett, 2018), differences between students' perceived level of engagement in LMS and their actual online behaviour (Vogt, 2016), and students' engagement with feedback in LMS (Winstone et al., 2020).

When it comes to using LMS log data (such as click counts or number of views) to measure student engagement, one problem is that such measures do not necessarily capture whether learners consume the material (Bulathwela et al., 2020). It has also been argued that student engagement differs greatly from popularity measures such as number of views and cannot be captured by unidimensional metrics because such measures do not necessarily measure the same thing (Fincham et al., 2019). Finding meaningful ways to represent the quantum and quality of engagement in online environments is a current challenge, and as such, research into the development of a reliable model of using click data to measure student engagement is ongoing (Bodily et al., 2017; Henrie et al., 2015; Vytasek et al., 2020).

The level at which engagement is being investigated also has implications for how engagement is conceptualized, operationalized, and measured. Due to the time-intensive nature of collecting engagement data by conventional survey tools, engagement has often been measured at the course level rather than the activity level, therefore limiting its usefulness for making activity-specific interventions that are based on the findings (Bodily, Graham, et al., 2017). Indeed, engagement needs to be measured at the same specificity level as the intervention (Wang, et al., 2014). Thus, if the interest is in better understanding and informing pedagogical practice related to a specific type of online learning resource, such as the use of online videos to support student learning, the most appropriate level of engagement for this focus would be the activity level, where measures focus on students' engagement in specific learning activities (Henrie et al., 2018).

As online learning increasingly moves towards becoming the primary format where students access tertiary education, it is important that the significant volume of data generated is meaningfully utilised by educators to optimise learning experiences. There are, however, ongoing problems with transforming the data into useful information to improve current learning environments. It is a task for which many educators feel they are insufficiently qualified and possess inadequate time to make good use of the data (Poon et al., 2017). Data are also often

only available in limited, general formats, such as text rich files or basic data visualization charts, and the LMS regularly do not collect the types of data that are needed for real-time analysis and reporting (Bodily, R., Graham, C. R., & Bush, M. D., 2017; Gómez-Aguilar, et al., 2015). Consequently, the raw data are often not meaningful for educators to diagnose, analyse or predict the usage situation in the LMS. Without effective processing, the large amount of data generated by the system may also lead to information overload for educators who, in turn, do not know what to do with the information, thus further contributing to discouraging assessment of data value (Bodily, R., Graham, C. R., & Bush, M. D., 2017; Poon et al., 2017).

To optimise the learning environment, research needs to focus on developing ways to help educators not only retrieve data about learning processes and relationships between learning agents, but to also help transform the log data gathered from LMS into actionable information. Indeed, few studies have fully exploited the learning data of students from a digital environment such as LMS (Poon et al., 2017), thus reflecting the limited usage of these data to inform teaching and learning. As argued by Bulathwela et al. (2020), a well-designed learning resource should enable the learner to achieve the expected learning outcomes. Research that helps educators design more informed, targeted resources will thus enable the optimisation of learning and the environments in which it occurs.

Methodology

This quantitative study explores the patterns of student engagement with online videos and the differences between the logs provided by Moodle[TM] and Vimeo®, a video hosting and sharing site. Moodle[TM] was the LM platform of the institution and the Vimeo® platform was selected as it was an easily available platform, contained the required analytics, offered password protection and was within the budget of the research project. The use of Moodle[TM] and Vimeo® are commonly available e-learning or video hosting platforms. During 2020, course teams from seven courses developed short videos for their students as part of their course content. The design and development of the videos were in the control of the course team with the stated purpose that the video was to link course theory to real-life practice. This gave a common theme for the videos across all courses while ensuring freedom in design appropriate to each discipline. The course team decided on the number, the duration, and the content of each video to ensure it was appropriate for the targeted course. However, all course team leaders were made aware of the guidelines of effective video design that was developed from previous research (Brame, 2016; Carmichael et al, 2018; Guo et al., 2014; Sherer & Shea, 2011). Courses in which these videos were used, and therefore in which LMS log data were collected, were in the fields of education, accounting, nursing, engineering, and physics. Data about how students accessed and interacted with the course video resources were collected across two semesters and altogether, the data for 77 videos were collected and analysed. Table 1 contains a summary of the courses. The study received ethics approval at the university where the study took place.

The videos were hosted in Vimeo® and were provided to students via hyperlink from the LMS. In the LMS, when a student clicked on a video link, the click was registered as evidence of the student having accessed the resource. Data from the LMS therefore provided cumulative totals of the percentage of students that are enrolled in the course who had accessed (or clicked on) the video link. In Vimeo®, the way the student then interacted with that video was recorded. Data collected in the Vimeo® platform included "loads,", "plays," "finishes" and average percentage of video watched. A load was counted each time the video loaded on any page. A play was registered anytime someone started to play the video. In the instance when a video is

played multiple times by the same viewer without a page refresh in Vimeo®, only a single play is counted. This includes scenarios in which viewers click the play button several times, scrub back to the beginning of the timeline, or loop the video. A finish occurred when a viewer watched a video through to the very end.

Table 1

Courses and Number of Videos

Course*	Semester One	Semester Two	Total	Video Purpose
Education Course A (EdA) 1st year Undergraduate	2 n=21	2 n=36	4	Course leader discussing link of content to use in practice.
Education Course B (EdB) 2nd year Undergraduate	2 n=61	2 n=56	4	Course leader discussing link of content to use in practice.
Education Course C (EdC) 3rd year Undergraduate	2 n=61	2 n=35	4	Course leader discussing link of content to use in practice.
Accounting (ACC) 2nd year Undergraduate	12 n=92	10 n=66	22	Weekly video linking current market finance data to course concepts.
Physics (PHY) 1st year Undergraduate	7 n=71	8 n=54	15	Confidence building in problem solving in physics context.
Education Course D (EdD) 4th year Undergraduate	3 n=64	7 n=50	10	Practitioner discussing use of technology in classroom.
Nursing (NUR) 2nd year Undergraduate	10 n=806	6 n=277	16	Demonstration of drug calculations.
Urban & Regional Planning (URP) 3rd year Undergraduate	-	2 n=116	2	Practitioner discussing application of residential density theory.
Total	38 n=1176	39 n=690	77	

*One course (sometimes referred to as a unit) of study in an undergraduate programme.

Of these measures (load, play, finish), a "play" in Vimeo® is most like a "click" in the LMS. Both indicate that a student had accessed a video resource, however neither provided any more information about *how* the student interacted with the video (i.e., did they watch the video after clicking on it). It is also worth noting that while the LMS is only able to record "clicks" that occur within its platform, Vimeo® is able to count "clicks" (loads/plays) across all platforms.

The LMS used in this study was Moodle[TM]. The data used in this study were obtained from the LMS system retrospectively via an algorithm written specifically for this study and enabled the log (click) data for every resource on a course LMS to be downloaded and displayed in a spreadsheet. The algorithm was written by an IT expert to extract the data required. The data are indicative of click counts only; that is, on any given date, the spreadsheet shows the total percentage of students who have clicked on a resource up to that date. Figure 1 shows how this data are displayed in the spreadsheet: the number of students enrolled in the course on any given

day is provided (row 2) and the percentage of students who have accessed the resources are provided, based on current enrolments (columns BC-BT). The learning analytics data from Vimeo® were also downloaded and displayed in a spreadsheet. This allowed the comparison required to explore the value of LMS data for the purpose of research aim 1, and to explore how log data may be used to better understand student engagement at the activity-level for the purpose of research aim 2.

Figure 1

Example from the Accounting Course of the Spreadsheet Display of LMS Log Data

	A	BC	BD	BE	BF	BG	BH	BI	BJ	BK	BL	BM	BN	BO	BP
1	At start of day:	Fri 2019-09-06	Sat 2019-09-07	Sun 2019-09-08	Mon 2019-09-09	Tue 2019-09-10	Wed 2019-09-11	Thu 2019-09-12	Fri 2019-09-13	Sat 2019-09-14	Sun 2019-09-15	Mon 2019-09-16	Tue 2019-09-17	Wed 2019-09-18	Thu 2019-09-19
2	# student enrolments:	69	68	67	67	67	67	67	67	67	67	67	67	67	67
3	Reality Bites video 1	27.5	26.5	25.4	25.4	26.9	26.9	26.9	26.9	26.9	26.9	26.9	26.9	26.9	26.9
4	Reality Bites video 2	13	13.2	13.4	13.4	14.9	14.9	14.9	14.9	14.9	14.9	14.9	14.9	14.9	16.4
5	Reality Bites video 3	10.1	10.3	10.4	10.4	11.9	11.9	11.9	11.9	11.9	11.9	11.9	11.9	11.9	13.4
6	Reality Bites video 4	7.2	7.4	7.5	7.5	9	9	9	9	9	9	9	9	9	10.4
7	Reality Bites video 5	2.9	2.9	3	3	4.5	4.5	6	6	6	6	6	6	6	7.5
8	Reality Bites video 6	0	0	1.5	1.5	3	3	4.5	4.5	4.5	4.5	4.5	4.5	4.5	6
9	Reality Bites video 7	1.4	1.5	3	3	3	3	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
10	Reality Bites video 8	0	0	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
11	Reality Bites video 9	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12	Reality Bites video 10	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Findings

Aim 1: To Explore the Value and Sufficiency of LMS Data

To examine the value and sufficiency of LMS log data for measuring student engagement at the activity-level, log data from the LMS were compared with the log data from Vimeo® to consider whether the LMS log data provide an accurate picture of how students engage with/access course resources at the activity-level. Specifically, click data from the LMS were compared to both plays and finishes on Vimeo®. Figure 2 maps total LMS clicks and total Vimeo® plays per video for semesters 1 and 2; and Figure 3 maps total LMS clicks and total Vimeo® finishes per video for each of the two semesters. In all the graphs, percentages over 100 indicate that some of the students clicked on or played the video multiple times.

Figure 2

Percentage of Vimeo® "Plays" and LMS "Clicks" for Semester 1 (top) and Semester 2 (bottom)
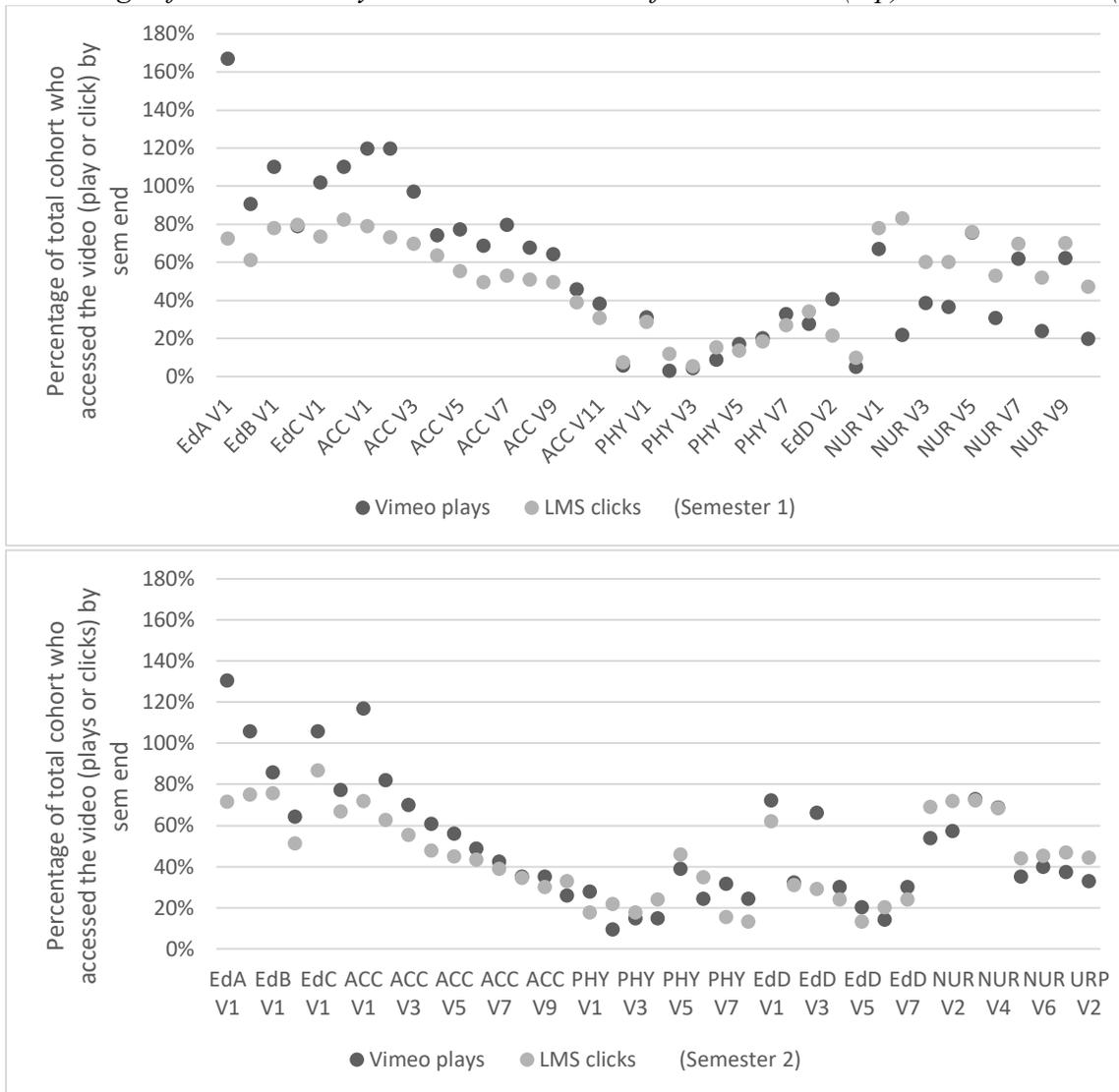
A comparison of the "clicks" in the LMS against the "plays" in Vimeo® —arguably the most similar measurement to a "click" in the LMS—shows that in some cases the Vimeo® plays are higher than the LMS clicks and in other cases this is reversed. On average, across both semesters, Vimeo® recorded a higher number of plays per video compared to LMS clicks (48 videos recorded higher plays on Vimeo®, while 29 recorded higher click counts on the LMS). Where the Vimeo® plays were higher than the LMS click counts, suggests students watching the video multiple times in Vimeo® without necessarily clicking through to it each time from the LMS. Where the LMS click counts were higher than Vimeo® plays, suggests students clicking on the link that was provided to them in the LMS and then choosing not to play the video once it had loaded. Either way, the differences, which were quite large in some cases (e.g., NUR V2, semester 1) show that the log data being captured in the LMS do not provide a complete picture of how students are accessing video resources.

Figure 3

Vimeo® "Finishes" and LMS "Clicks" for Semester 1 (top) and Semester 2 (bottom)
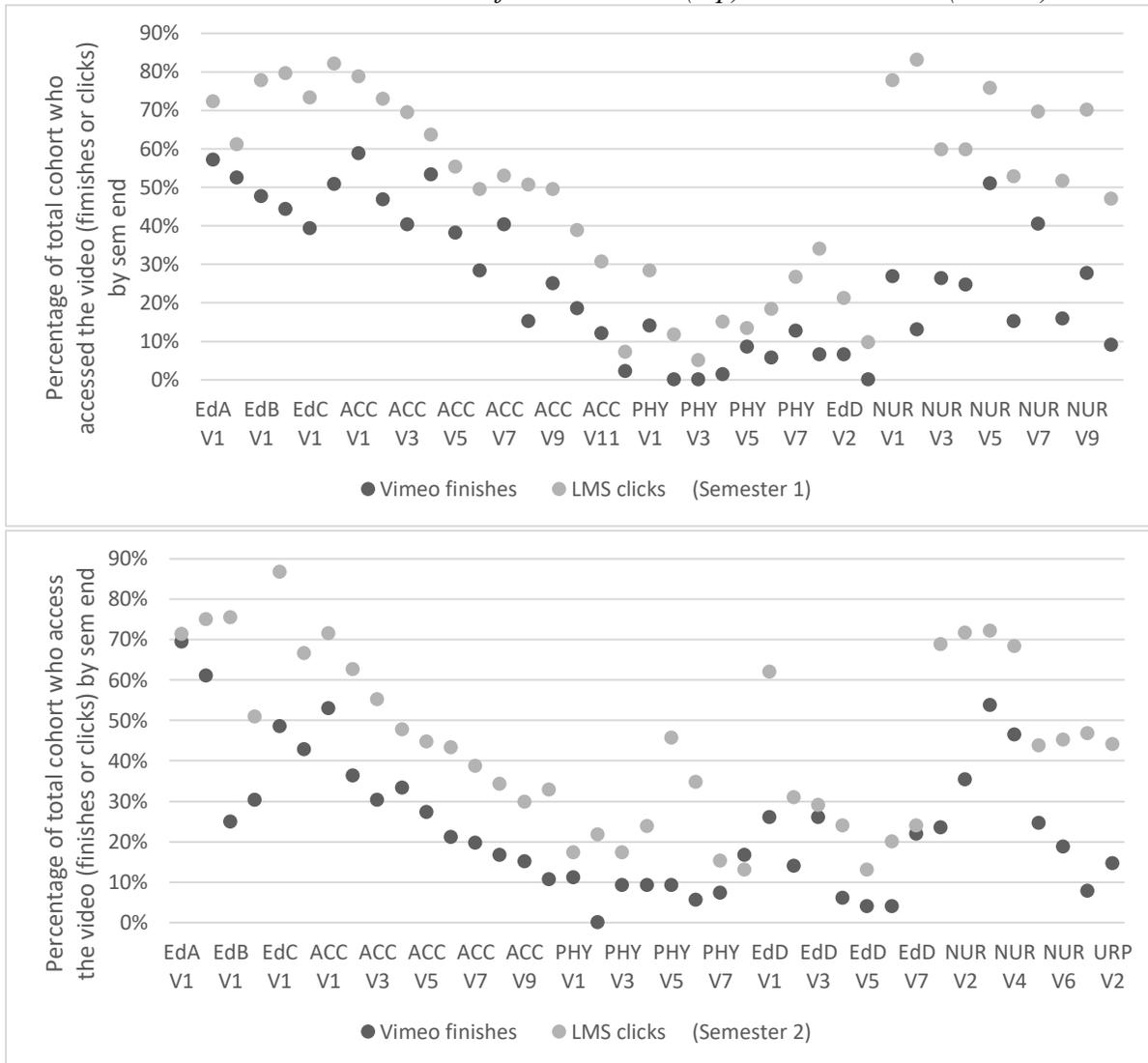
A comparison of the "clicks" in the LMS and the "finishes" in Vimeo® further illustrate the problem with relying on click data alone to make assumptions about student engagement. As illustrated in Figure 3, Vimeo® finishes were lower—and in many cases much lower—than LMS clicks in all except one of the videos (in PHY V8 finishes were higher in S2). This shows that while students may have clicked on the link to the video in the LMS and therefore are captured as having accessed the video according to LMS analytics, only some of those students go on to watch the video. Even then, there are questions as to whether students actively engage with the video, or whether they simply have it playing in the background while multitasking (Bulathwela et al., 2020; Guo et al., 2014). Interestingly, a comparison across videos indicates that videos showing an industry professional were less likely to be accessed then those that did not. This was the case within a discipline (for example, education) and between disciplines (for example, urban & regional planning compared to nursing). Also, a comparison across disciplines

indicates some difference. For example, the physics videos were not accessed to the same extent as the accounting and nursing videos, but they were much more likely to record a finish. However, this observation needs to be appraised considering the length of the video and the number of videos contained in a course which, as discussed below, was shown to affect the likelihood of student access.

Aim 2: To Understand Student Engagement at the Activity Level Through Log Data

To examine how log data may be used to better understand student engagement at the activity level, log data from Vimeo® were analysed to explore in more detail how students interacted with the video resources. Specifically, the log data were analysed to: compare "loads," "plays," and "finishes"; examine the impact of the video length on engagement; and examine how engagement with videos changed over the course of a semester when multiple video resources were used in the course. Gaining a more in depth understanding of how students engage at the activity (or resource) level with course video resources is important for helping to inform the design of such videos and therefore assist academics to optimise how these resources are used to support students in their coursework.

Does load, play, and finishes analytic data improve our understanding of student behaviour?

Comparing loads, plays, and finishes can provide some insight into students' patterns of behaviour in relation to engagement with course video resources. The number of times a video is loaded ("loads") arguably provides some indication of students' intention to watch (engage with) the video. By clicking on the link to the video, students have taken the first step towards engagement behaviour. After the video has loaded, students who then initiate a "play," and who therefore start to watch the video, are taking the next step towards engaging with that video, thus moving from intention to actual engagement behaviour. Students who then go on to watch the entire video (at least according to log data) are those that have arguably bridged the intention-behaviour gap (Sheeran & Webb, 2016) to engage with the video resources more fully.

Figure 4

Comparison of Loads, Plays, and Finishes for Total Data Across Both Semesters.
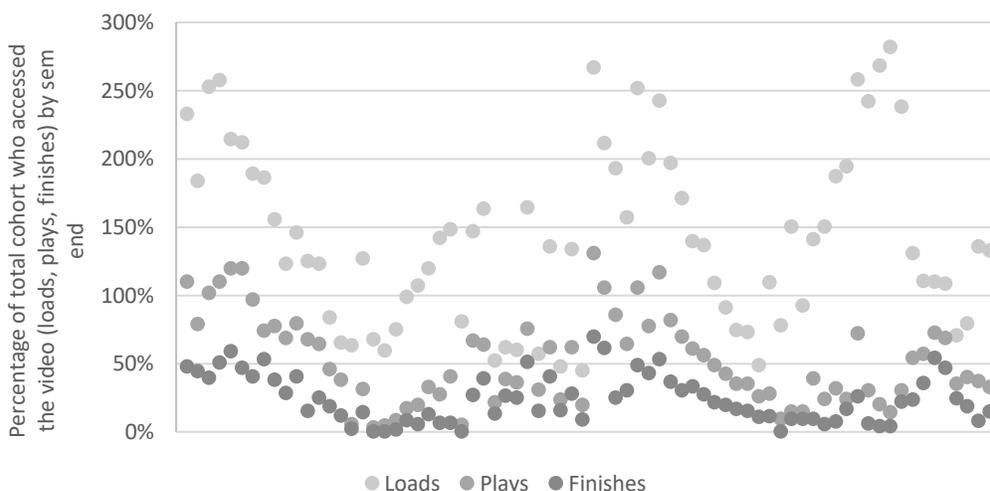
Figure 4 compares "loads," "plays," and "finishes" for all the videos used in the intervention across the two semesters. This figure highlights a definite pattern which shows a drop in the

percentage of students who click on the video to load it, compared to the number who initiate a play, compared to the number who then watch that video to completion.

Figure 5 compares "plays" against "loads" and "finishes" against "plays" to show the proportion of times a play was initiated for a video out of the number of times the video was loaded, and the proportion of times the video was played until the end out of the number of times it was started. On average, across all the videos for both semesters, 36% of students who clicked the video link to load the video then initiated a play. Of those who did initiate a play, 43% watched the video to the end.

Figure 5

Ratio of Plays: Loads and Finishes: Plays for Semester 1 (top) and Semester 2 (bottom).
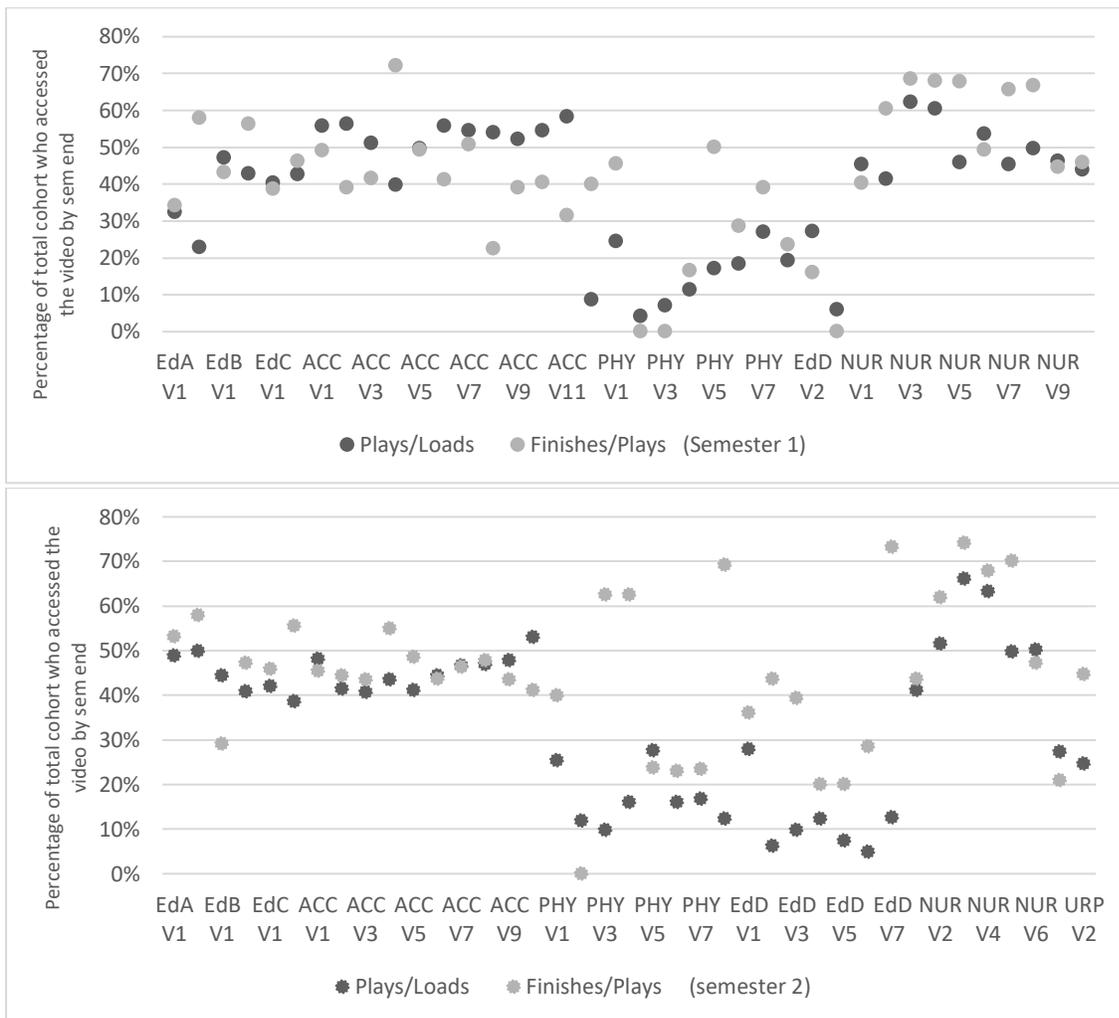
The drop-off that occurs between the percentage of students who load the video by clicking on its link (indicated by number of loads) to the number of students who then initiate a play and go onto watch the video in its entirety can be mapped on an attrition curve. In other disciplines such as medicine/health, finance, commerce, economics, and management, attrition models have been used to measure such factors as the loss of clients, customers, or participants over time (e.g. Au et al., 2003; Hochheimer et al., 2016; Ruhanen, et al., 2015; Smith, 2010). In

online education, attrition models have been used to measure, for example, retention, attrition and participation in MOOC activities, open access online learning, and online education programs, (e.g. Glance et al., 2014; Greenland & Moore, 2014; Knestrick et al., 2016; Yang et al., 2014; Yukselturk et al., 2014). As the concept of attrition refers to the gradual reduction in size of a variable (such as customers, or in this case the number of students accessing a particular course resource), the attrition curve will usually slope downwards from left to right; that is, it has a negative association. Such a curve can also be used to map student engagement at the resource/activity-level.

Figure 6 maps the attrition curve of student engagement with the coursework videos in this study. It highlights the rapid decline that occurs between students displaying an intention to engage with course video resources, as indicated by the fact they clicked on the video link and the video loaded on their computer/device, and their subsequent actual engagement behaviour, as indicated by their behaviour of initiating a play. This rapid decline between the choice to load the video and the choice to watch the video indeed highlights a problem for educators who create and use the videos as part of their course content. It also poses the question—*Why do so many students chose not to watch the video once it has loaded on their screen*? Perhaps the thumbnail of the video that loads is not appealing or interesting enough to warrant watching. Would students be more likely to initiate a play if the first impression of the video was more appealing or interesting? Were the thumbnails used in these courses not enticing for a student to explore the video? The results suggest that the first impression of a video via its thumbnail is of considerable importance to its eventual use by students.

Figure 6

Average Attrition with Respect to the Data for Loads, Plays and Finishes.
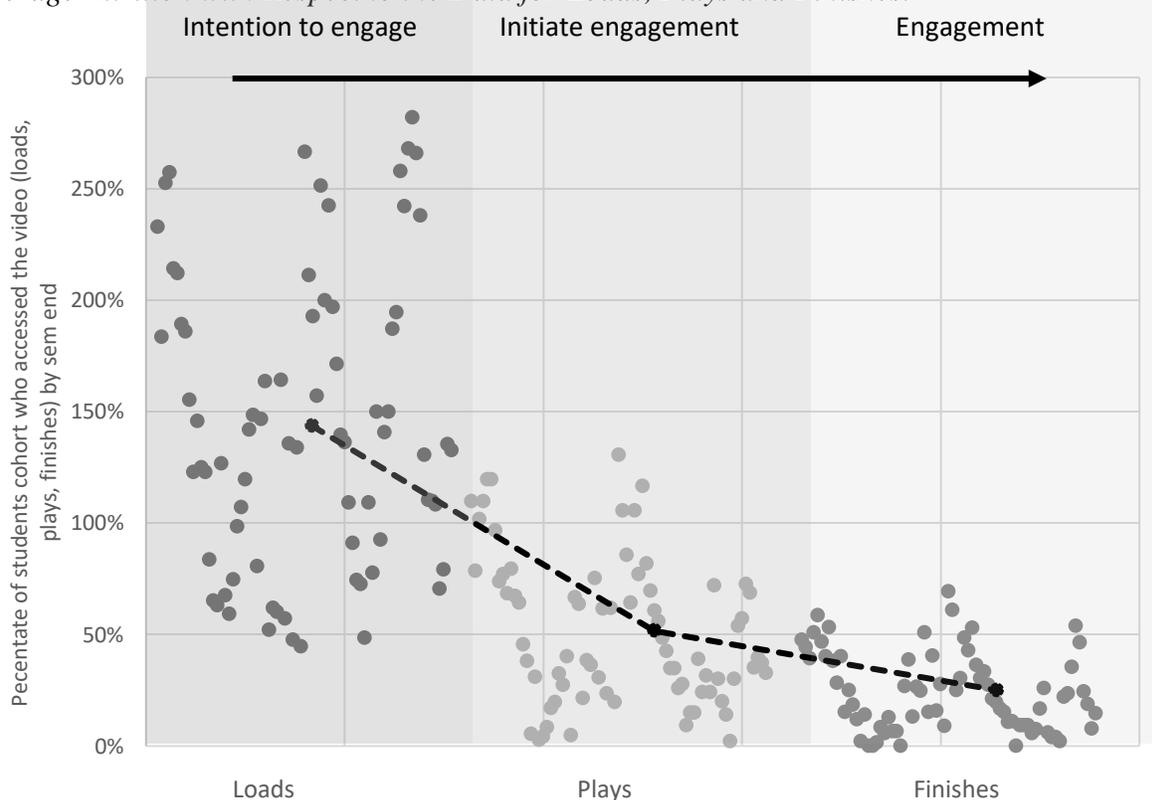
Does video length matter?

Research has found that in relation to instructional videos, shorter videos are more engaging (Brame, 2016; Carmichael et al., 2018; Guo et al., 2014). Guo et al. (2014), for example, found that student engagement with such videos drops off after about six minutes (360 seconds). In this current study, the videos used ranged in length from 1.5 minutes (85 seconds) to almost 23 minutes (1380 seconds). The impact of video length/duration on engagement was explored in two ways: first, finishes per play—the proportion of times a video was played until the end, out of the number of times it was started—was mapped against video duration; and second, the average percentage of the video that was watched before students clicked off was mapped against video duration.

Figure 7
The Relationship Between Duration and Finishes (top) and Percent of Video Viewed (bottom)
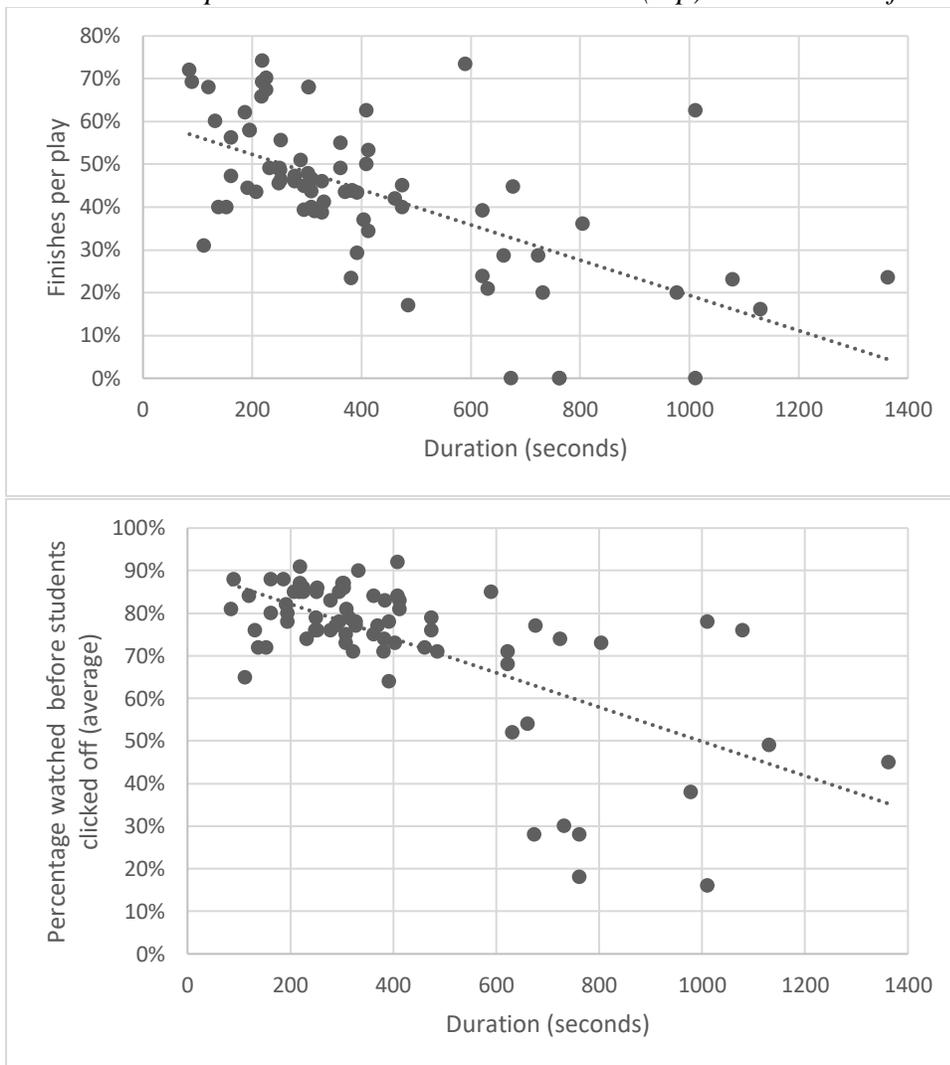
The trend lines in both graphs in Figure 7 show that as video duration increases, the propensity for students to watch the video to the end declines. Indeed, a higher proportion of students are more likely to watch the video to the end when the video is shorter in duration. These findings support the findings of previous research. On average, students watched 74% of the video before they clicked off. It is interesting to note that even for the shorter videos, students tended to click off after watching only 70-80% of the video. Is this because students felt they had watched enough to understand the idea the video was trying to convey? Was it because they felt the video was in its "wrap up" phase? If such a "wrap up" was simply repeating information already raised in the video, then perhaps it was perceived as having no more value to students as they already had the information. Certainly, in some of the videos used in this study, the instructor did spend some time at the end providing a "wrap up" to the video. In considering how to optimise how video resources are designed and produced, this finding suggests that such a "wrap up" is not needed at the end of the video because students will click off anyway. This is something worth exploring to inform how video content can be designed, developed, and produced in a manner that will make the video more engaging for students and to thus ensure instructors optimise video content that students will access in the limited time before their attention wanes.

Does student behaviour change over time during the semester?

As well as exploring the effect of video duration on engagement, how students engaged with videos changed over the course of a semester when multiple video resources were used in the course was also examined. Five of the courses provided students with multiple instructional videos. These videos became available across the semester as part of the course content. Figure 8 shows the percentage of students enrolled in each course who initiated a play for each video. In most of these courses, students' propensity to watch the videos declined over time (the semester) when multiple instructional videos were used to provide course content.

While it is difficult to draw conclusions about the data because they are based on examples from only five courses, the decrease in propensity to watch the videos may suggest that there is such a thing as having "too many" instructional videos as part of a course's content. This would also suggest that although instructional videos may be useful for increasing students' engagement in a course, having too many videos that are too similar may indeed have the opposite effect and students may start to become disengaged from this type of resource.

Figure 8

Propensity to Watch Multiple Course Videos as They Became Available Over a Semester
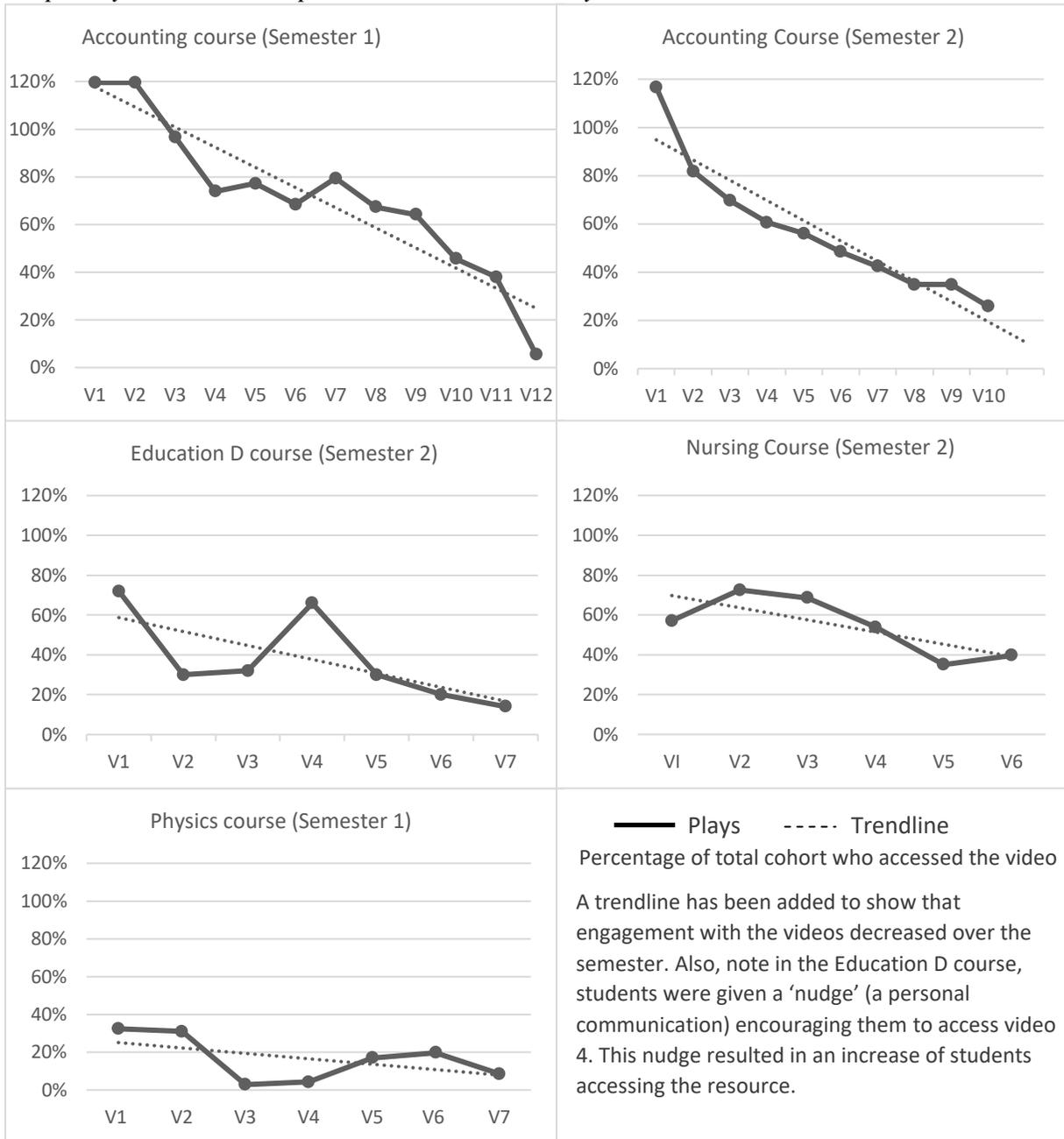
The comparative analysis of learning analytics data across two platforms showed a difference in the record of the number of clicks, plays and views. This simple comparison of specific resources (videos) across two platforms for several different courses over two teaching periods illustrates the care required in planning, executing, and harvesting LA data. Further, the effort required to extract the LA data required an IT expert to apply a specifically written algorithm. The time and expertise needed would be beyond most staff and thus curtail the widespread adoption of LA data use in a business-as-usual, sustainable way.

There is a decline in the number of students who load, then play and then finish watching a video. This is modelled on an attrition curve. Approximately a third of those who "loaded" then "played," and just under half of those "finished." This suggests that effort directed to increasing the "loads" to "plays" would more likely give the greater return then effort directed to increasing the "plays" to "finishes." This effort could be directed to ensuring an enticing thumbnail. Further, the analysis showed that students click-off at about the 70-80% point regardless of video length suggesting that energy directed at the last 20% of the video to encourage a "finish" may not yield higher uptake of "finishes." Longer videos decreased the likelihood of a "finish." Additionally, the number of videos in a course over the same semester reduced the propensity of students initiating a play for each video over the course of the semester.

Discussion

As much time and effort is needed to design and produce course video resources, it is important for educators to be able to seek multiple avenues of assessing how the video was received by students and this would include the use of LA data. This therefore helps educators to assess how well the resource is being utilised (i.e., how many students accessed the video resource and how much of it they watched) and to thus refine the resource if required based on the student access and engagement behaviours. Such analysis and any related refining of the resource will indeed help ensure the optimisation of its design and use. It is not to say that videos with low uptake are not valuable. Indeed, for some students it may provide the much-needed link to the course and what may be needed in such a case is to direct the right students to the video in the first place. While click (or "plays" or "views") data have been used to measure whether students are accessing a resource, such measures are not a reliable measure. As shown in this paper, the two different interfaces used to collect student log data related to whether students clicked on a video resource often recorded quite different click counts. This alone shows that "clicks", "plays," or "views" are not reliable as a measure of student access to a resource, let alone as a measurement of student engagement. Indeed, while click data (or "plays" or "view" of a video) may show that students are clicking on the resource, this data do not show how the student then went on to engage with the resource. This research was limited to two platforms, Moodle™ and Vimeo®. Future research could extend the findings to examine any "platform" effect across the multiple platforms available.

More recently, in relation to how students access course video resources, LMS have started to make available such measures as average percentage of video watched. As shown in this paper, more detailed log data measures, including how many students finish watching a video compared to how many starts watching the video, the average percentage of a video watched before students click off, and the ability to compare loads to plays to finishes are all important in gaining a more in depth understanding of how students interact—or engage— with course video resources.

This finding through the simple comparison of two platforms signals a need to ensure educators (academics and university management) are clear about what they are measuring, why they are measuring it and how it will influence future learning resources and features. Importantly, it should be considered what the LA did not capture, and what simply cannot be captured by the LA. The contrary view put forward by Selwyn (2020) is pertinent here to ensure that generalised macro data, while relevant and useful, are considered and applied in the light of its limitations. This sense of the data not capturing the full story may be one factor that Kollom

et al. (2021) was referring to when they found that academics are not wanting to be compelled to act on LA data.

Further to the value and sufficiency of LA data, was the ease of data extraction. There were limits as to how the system users were able to access their course data, which complicated the data analysis and data reporting. As the data were not able to be easily accessed retrospectively, the result was that some portions of the software needed to be modified and an algorithm formulated to ensure that the necessary data were available for analysis. This experience supports existing research that have signaled the time and expertise needed for academics to fully utilize the LA data (Munguia et al., 2020; Kollom, et al., 2021). Shibani, et al. (2020) found that time was a significant factor for integration of LA into teaching. This signals a need for institutions to provide resources in the form of expertise and extra time for academics if usefulness and scalability is to be achieved at any meaningful level. Whilst future technological advancements may improve accessibility, the need to provide suitable expertise and time to analyze and prescribe changes necessary for improvement would remain.

The results also highlight the rapid decline between the choice to load the video and to watch the video. It is probable that changing a thumbnail could lead to changes in student behaviour when selecting a video to view. Even a small increase in the number of plays initiated compared to loads would lead to an increase in the number of "finishes." Inspecting Figure 6 shows that effort needs to be focused on converting "loads" to "plays" –or intention to behaviour–because even a small increase in the percentage of students initiating a play could consequently lead to an increase in the percentage of students then engaging with the video resource more fully and potentially watching it to the end, and thus flattening the attrition curve. Future research could explore strategies for converting students' intention to view the video (loads) to actual engagement with the video (plays, leading into finishes). The first impression of a video (based on its thumbnail) could be one factor to explore how to increase a students' propensity to engage. Other factors worth exploring could include the number of videos in a course or program, whether the video contains an industry professional, and differences across program and course level. Additionally, future research could explore the characteristics of those students more or less likely to access and play a video.

The length of the video influenced engagement as did the quantum of videos contained in a single course over a semester. This suggests that a "whole of semester" design approach is needed when seeking to engage students. While this study was concerned with the activity level of analysis, future research could investigate the "whole of semester" student engagement via the analysis of all activity log data. Future research could also explore the influence of activity level across several courses in a program undertaken by a student cohort in the same semester. It may be that a course heavily reliant on video resources may affect the use of resources in courses undertaken by students contemporaneously.

A limitation of this research is that it was limited to one university. Future research could involve other universities that also use Moodle[TM] as their LMS or to compare other LMS data. A qualitative study would also complement this quantitative study by revealing why students stop watching, why they would start watching and what they do in between. Despite the limitations this study improves our understanding of the value of analytics data and how it can be used to inform educators of student behaviour and thus activity choice.

Conclusion

The aims of this study were to explore the value and sufficiency of LMS data and to seek understanding of student behaviour through the information contained in the log data at the activity level. The analysis of the log data revealed the limited sufficiency of LMS data when compared to another platform. The results also showed a negative attrition curve as the level of commitment to the resource increased. This supports previous research examining attrition models in online education and other disciplines (Glance et al., 2014; Greenland & Moore, 2014; Knestrick et al., 2016; Yang, et al., 2014; Yukselturk et al.,, 2014). Comparing loads, plays, and finishes on an attrition curve, for example, can provide insight into student behaviours and possibly provide insight into both how engaging a video might look to students, as well as how engaging it then is. For example, if "loads" significantly exceed subsequent "plays" then this perhaps highlights a problem with the video or its thumbnail (i.e., it does not look interesting enough to students, so they choose not to play it); if "plays" significantly exceed "finishes" then perhaps the content is not engaging or relevant. In both cases, the significant decline between loads then plays or plays and finishes could imply there is a potential problem with the video resource and thus indicate that the resource needs to be modified to better meet student needs. Indeed, such data and the insights it provides in relation to student engagement at the activity/resource level are important for informing both the design of course resources and for optimising their use in the course.

Availability of Data and Materials
The data generated during the current study are available from the corresponding author on reasonable request.

Declaration Competing interests
The authors declare that they have no competing interests.

Ethics
Ethics approval for this work was granted by the University of Southern Queensland.

References

Alfayez, Z. (2021). Designing educational videos for university websites based on students' preferences. *Online Learning, 25*(2), 280-298. doi:doi.org/10.24059/olj.v25i2.2232. https://olj.onlinelearningconsortium.org/index.php/olj/article/view/2232

Au, T., Li, S., & Ma, G. (2003). Applying and evaluating models to predict customer attrition using data mining techniques. *Journal of Comparative International Management, 6*(1), 10-22. https://journals.lib.unb.ca/index.php/JCIM/article/view/442/736

Australian Government Department of Education and Training. (2016*). QILT: Quality Indicators for Learning and Teaching*. https://www.qilt.edu.au/

Axelsen, M., Redmond, P., Heinrich, E., & Henderson, M. (2020). The evolving field of learning analytics research in higher education: From data analysis to theory generation, an agenda for future research. *Australasian Journal of Educational Technology, 36*(2), 1-7. http://doi:10.14742/ajet.5510

Barua, P. D., Zhou, X., Gururajan, R., & Chan, K. C. (2018). Determination of factors influencing student engagement using a Learning Management System in a tertiary setting. In *2018 IEEE/WIC/ACM International Conference on Web Intelligence* (pp. 604-609). Santiago: Institute of Electrical and Electronics Engineers (IEEE). https://www.semanticscholar.org/paper/Determination-of-Factors-Influencing-Student-Using-Barua-Zhou/06ffdc5b4b987ba39c3184c204886f6055b9c80d

Beer, C., Clark, K., & Jones, D. (2010). Indicators of engagement. In *Proceedings ASCILITE 2010* (pp. 75-86). Sydney: Australasian Society for Computers in Learning in Tertiary Education. https://ascilite.org/conferences/sydney10/procs/Beer-full.pdf

Bodily, R., Graham, C. R., & Bush, M. D. (2017). Online learner engagement: Opportunities and challenges with using data analytics. *Educational Technology, 57*(1), 10-18. http://www.jstor.com/stable/44430535

Bodily, R., Nyland, R., & Wiley, D. (2017). The RISE framework: Using learning analytics to automatically identify open educational resources for continuous improvement. *International Review of Research in Open and Distributed Learning, 18*(2), 103-122. http://www.irrodl.org/index.php/irrodl/article/view/2952

Bond, M., Buntins, K., Bedenlier, S., Zawacki-Richter, O., & Kerres, M. (2020). Mapping research in student engagement and educational technology in higher education: A systematic evidence map. *International Journal of Educational Technology in Higher Education, 17*(2), 1–30. https://doi.org/10.1186/s41239-019-0176-8

Brame, C. J. (2016). Effective educational videos: Principles and guidelines for maximizing student learning from video content. *CBE Life Science Education, 15*(4), 1-6. http://doi:10.1187/cbe.16-03-0125

Brozina, C., Knight, D. B., Kinoshita, T., & Johri, A. (2019). Engaged to succeed: Understanding first-year engineering students' course engagement and performance through analytics. *IEEE Access, 7*, 163686-163699. http://doi:10.1109/ACCESS.2019.2945873

Bulathwela, S., Pérez-Ortiz, M., Lipani, A., Yilmaz, E., & Shawe-Taylor, J. (2020). Predicting engagement in video lectures. In A. N. Rafferty, J. Whitehill, C. Romero, & V. Cavalli-Sforza (Eds.), *Proceedings of the 13th International Conference on Educational Data Mining* (pp. 50-60). Montreal: International Educational Data Mining Society. https://educationaldatamining.org/files/conferences/EDM2020/papers/paper_62.pdf

Carmichael, M., Reid, A.-K., & Karpicke, J. D. (2018). *Assessing the impact of educational video on student engagement, critical thinking and learning: The current state of play. A SAGE White Paper*. SAGE Publishing. https://us.sagepub.com/sites/default/files/hevideolearning.pdf

Casey, K., & Azcona, D. (2017). Utilizing student activity patterns to predict performance. *International Journal of Educational Technology in Higher Education, 14,* article 4. http://doi:10.1186/s41239-017-0044-3

Dixson, M. D. (2015). Measuring student engagement in the online course: The Online Student Engagement scale (OSE). *Online Learning, 19*(4). http://doi:10.24059/olj.v19i4.561

Fincham, E., Whitelock-Wainwright, A., Kovanović, V., Joksimović, S., van Staalduinen, J.-P., & Gašević, D. (2019). Counting clicks is not enough: Validating a theorized model of engagement in learning analytics. In *LAK19: The 9th International Learning Analytics & Knowledge Conference* (pp. 501-510). New York: Association for Computing Machinery. https://dl.acm.org/doi/10.1145/3303772.3303775

Gašević, D., Dawson, S., & Siemens, G. (2015). Let's not forget: Learning analytics are about learning. *TechTrends, 59*(1), 64-71. https://link.springer.com/content/pdf/10.1007/s11528-014-0822-x.pdf

Gašević, D., Mirriahi, N., Long, P., & Dawson, P. (2014). Editorial: Inaugural issue of the journal of learning analytics. *Journal of Learning Analytics, 1*(1), 1-2. https://learning-analytics.info/index.php/JLA/article/view/3910

Giannakos, M. N., Sampson, D. G., & Kidziński, Ł. (2016). Introduction to smart learning analytics: foundations and developments in video-based learning. *Smart Learning Environments, 3,* article 12. http://doi.org/10.1186/s40561-40016-40034-40562

Glance, D. G., Hugh, P., & Barrett, R. (2014, November 23-26). *Attrition patterns amongst participant groups in Massive Open Online Courses.* Paper presented at the ASCILITE 2014 (Australasian Society for Computers in Learning in Tertiary Education), Dunedin. https://www.ascilite.org/conferences/dunedin2014/files/fullpapers/16-Glance.pdf

Gómez-Aguilar, D. A., Hernández-García, A., García-Peñalvo, F. J., & Therón, R. (2015). Tap into visual analysis of customization of grouping of activities in elearning. *Computers in Human Behavior, 47*(June), 60-67. http://doi:10.1016/j.chb.2014.11.001

Greenland, S., & Moore, C. (2014). Patterns of online student enrolment and attrition in Australian open access online education: A preliminary case study. *Open Praxis, 6*(1), 45-54. https://www.learntechlib.org/p/130685/

Guo, P. J., Kim, J., & Rubin, R. (2014). How video production affects student engagement: An empirical study of MOOC videos. In *L@S '14: Proceedings of the first ACM conference on Learning @ scale conference* (pp. 41-50). Atlanta: Association for Computing Machinery. https://dl.acm.org/doi/10.1145/2556325.2566239

Harindranathan, P. and Folkestad, J., 2019. Learning analytics to inform the learning design: Supporting instructors' inquiry into student learning in unsupervised technology-enhanced platforms. *Online Learning*, *23*(3), pp.34-55. https://olj.onlinelearningconsortium.org/index.php/olj/article/view/2057

Henrie, C., Bodily, R., Larsen, R., & Graham, C. R. (2018). Exploring the potential of LMS log data as a proxy measure of student engagement. *Journal of Computing in Higher Education, 30*, 344-362. http://doi:10.1007/s12528-017-9161-1

Henrie, C., Bodily, R., Manwaring, K. C., & Graham, C. R. (2015). Exploring intensive longitudinal measures of student engagement in blended learning. *International Review of Research in Open and Distributed Learning, 16*(3), 133-155. http://www.irrodl.org/index.php/irrodl/article/view/2015/3386

Green, B. (2021). Data science as political action: Grounding data science in a politics of justice. *Journal of Social Computing*, *2*(3), 249-265. https://dx.doi/10.23919/JSC.2021.0029

Hochheimer, C. J., Sabo, R. T., Krist, A. H., Day, T., Cyrus, J., & Woolf, S. H. (2016). Methods for evaluating respondent attrition in web-based surveys. *Journal of medical Internet research, 18*(11), e301. http://doi:10.2196/jmir.6342

Ismail, S. N., Hamid, S., & Chiroma, H. (2019). The utilization of learning analytics to develop student engagement model in learning management system. *Journal of Physics: Conference Series, Article 1339*. http://doi:10.1088/1742-6596/1339/1/012096

Jordan, M. M., & Duckett, N. D. (2018). Universities confront "tech disruption": Perceptions of student engagement online using two learning management systems. *The Journal of Public and Professional Sociology, 10*(1). https://digitalcommons.kennesaw.edu/jpps/vol10/iss1/4

Karaksha, A., Grant, G., Anoopkumar-Dukie, S., Nirthanan, S. N., & Davey, A. K. (2013). Student engagement in pharmacology courses using online learning tools. *American Journal of Pharmaceutical Education, 77*(6).http://doi:10.5688/ajpe776125

Keyes, O. (2019). Counting the countless. *Real Life.* 8th April. https://reallifemag.com/counting-the-countless/

Kizilcec, R. F., Piech, C., & Schneider, E. (2013). Deconstructing disengagement: analyzing learner subpopulations in massive open online courses. In *LAK '13: Proceedings of the Third International Conference on Learning Analytics and Knowledge* (pp. 170-179). New York: Association for Computing Machinery. https://web.stanford.edu/~cpiech/bio/papers/deconstructingDisengagement.pdf

Knestrick, J. M., Wilkinson, M. R., Pellathy, T. P., Lange-Kessler, J., Katz, R., & Compton, P. (2016). Predictors of retention of students in an online nurse practitioner program. *The Journal for Nurse Practitioners, 12*(9), 635-640. http://doi:10.1016/j.nurpra.2016.06.011

Kollom, Kaire; Kairit Tammets; Maren Scheffel; Yi-Shan Tsai; Ioana Jivet; Pedro J Muñoz-Merino; Pedro Manuel Moreno-Marcos; Alexander Whitelock-Wainwright; Adolfo Ruiz Calleja and Dragan Gasevic (2021). A four-country cross-case analysis of academic staff expectations about learning analytics in higher education.', *The Internet and Higher Education* 49:100788. https://doi.org/10.1016/j.iheduc.2020.100788

Krause, K.-L. (2005). *Understanding and promoting student engagement in university learning communities*. http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.659.6304&rep=rep1&type=pdf

Li, N., Kidziński, Ł., Jermann, P., & Dillenbourg, P. (2015). MOOC video interaction patterns: What do they tell us? In G. Conole, T. Klobučar, C. Rensing, J. Konert, & E. Lavoué (Eds.), *Design for teaching and learning in a networked world. 10th European Conference on Technology Enhanced Learning* (pp. 197-210). Cham: Springer International Publishing Switzerland. https://www.springerprofessional.de/en/mooc-video-interaction-patterns-what-do-they-tell-us/2540034

Macfadyen, L. P., & Dawson, S. (2010). Mining LMS data to develop an ''early warning system'' for educators: A proof of concept. *Computers & Education, 54*(2), 588-599. http://doi:10.1016/j.compedu.2009.09.008

Marks, A., Al-Ali, A., & Rietsema, K. (2016). Learning management systems: A shift toward learning and academic analytics. *International Journal of Emerging Technologies in Learning, 11*(4), 77-82. http://doi:10.3991/ijet.v11i04.5419

Muir, T., Milthorpe, N., Stone, C., Dyment, J., Freeman, E., & Hopwood, B. (2019). Chronicling engagement: Students' experience of online learning over time. *Distance Education, 40*(2), 262–277. https://doi.org/10.1080/01587919.2019.1600367

Munguia, Pablo; Amelia Brennan; Sarah Taylor and David Lee 2020 'A learning analytics journey: Bridging the gap between technology services and the academic need', *The Internet and Higher Education* 46:100744. https://doi.org/10.1016/j.iheduc.2020.100744

Noetel, M., Griffith, S., Delaney, O., Sanders, T., Parker, P., del Pozo Cruz, B. and Lonsdale, C. (2021). Video improves learning in higher education: A systematic review. *Review of Educational Research* 91(2):204-236. https://doi.org/10.3102%2F0034654321990713

Pardo, A., Ellis, R. A., & Calvo, R. A. (2015). Combining observational and experiential data to inform the redesign of learning activities. In *LAK '15: Proceedings of the Fifth International Conference on Learning Analytics And Knowledge* (pp. 305-309). New York: Association for Computing Machinery. https://dl.acm.org/doi/10.1145/2723576.2723625

Poon, L. K. M., Kong, S.-C., Yau, T. S. H., Wong, M., & Ling, M. H. (2017). Learning analytics for monitoring students participation online: Visualizing navigational patterns on learning management system. In S. K. S. Cheung, L.-f. Kwok, W. W. K. Ma, L.-K. Lee, & H. Yang (Eds.), *Blended Learning. New Challenges and Innovative Practices. 10th International Conference on Blended Learning* (pp. 166-176). Hong Kong: Springer International Publishing. https://repository.eduhk.hk/en/publications/learning-analytics-for-monitoring-students-participation-online-v-7

Panigrahi, R., Srivastava, P.R. and Sharma, D., 2018. Online learning: Adoption, continuance, and learning outcome—A review of literature. *International Journal of Information Management*, *43*, pp.1-14. https://doi.org/10.1016/j.ijinfomgt.2018.05.005

Rienties, B., Toetenel, L., & Bryan, A. (2015). "Scaling up" learning design: impact of learning design activities on LMS behavior and performance. In *LAK '15: Proceedings of the Fifth International Conference on Learning Analytics And Knowledge* (pp. 345-319). New York: Association for Computing Machinery. https://dl.acm.org/doi/10.1145/2723576.2723600

Ruhanen, L., Whitford, M., & McLennan, C.-L. (2015). Indigenous tourism in Australia: Time for a reality check. *Tourism Management, 48*, 73-83. http://doi:10.1016/j.tourman.2014.10.017

Selwyn, Neil 2020 Re-imagining 'Learning Analytics'… a case for starting again?', *The Internet and Higher Education* 46:100745. https://doi.org/10.1016/j.iheduc.2020.100745

Sheeran, P., & Webb, T. L. (2016). The intention–behavior gap. *Social and Personality Psychology Compass, 10*(9), 503-518. http://doi:10.1111/spc3.12265

Sherer, P., & Shea, T. (2011). Using online video to support student learning and engagement. *College Teaching, 59*(2), 56-59. http://doi:10.1080/87567555.2010.511313

Shibani, A., Knight, S., & Shum, S. B. (2020). Educator perspectives on learning analytics in classroom practice. *The Internet and Higher Education*, *46*, 100730. https://doi.org/10.1016/j.iheduc.2020.100730

Smith, D. (2010). Valuation of customer relationships: Choice, application and results of various attrition analysis methodologies. *Business Valuation Review, 29*(2), 44-53. http://doi:10.5791/0897-1781-29.2.44

Stewart, M., Stott, T., & Nuttall, A.-M. (2011). Student engagement patterns over the duration of level 1 and level 3 geography modules: Influences on student attendance, performance and use of online resources. *Journal of Geography in Higher Education, 35*(1), 47-65. http://doi:10.1080/03098265.2010.498880

The Social Research Centre. (2019). *Quality Indicators for Learning and Teaching (QILT)*. https://www.qilt.edu.au/

Venugopal, G., & Jain, R. (2015). Influence of learning management system on student engagement. In *2015 IEEE 3rd International Conference on MOOCs, Innovation and Technology in Education (MITE)* (pp. 427-432). Amritsar: Institue of Electrical and Electronics Engineers (IEEE). http://toc.proceedings.com/29135webtoc.pdf

Vogt, K. L. (2016). *Measuring student engagement using learning management systems* (Doctoral dissertation, University of Toronto (Canada)).http://hdl.handle.net/1807/73213

Vytasek, J. M., Patzak, A., & Winne, P. H. (2020). Analytics for student engagement. In M. Virvou, E. Alepis, G. A. Tsihrintzis, & L. C. Jain (Eds.), *Machine learning paradigms. Advances in learning analytics* (pp. 23-48). Cham: Springer Nature Switzerland.

Wang, Z., Bergin, C., & Bergin, D. A. (2014). Measuring engagement in fourth to twelfth grade classrooms: The classroom engagement inventory. *School Psychology Quarterly, 29*(4), 517-535. http://doi:10.1037/spq0000050

Williams, D., & Whiting, A. (2016). Exploring the relationship between student engagement, Twitter, and a learning management system: A study of undergraduate marketing students. *International Journal of Teaching and Learning in Higher Education, 28*(3), 302-313. https://files.eric.ed.gov/fulltext/EJ1125099.pdf

Winstone, N., Bourne, J., Medland, E., Niculescu, I., & Rees, R. (2020). "Check the grade, log out": students' engagement with feedback in learning management systems. *Assessment & Evaluation in Higher Education*, *46*(4), 631-643. https://www.tandfonline.com/doi/full/10.1080/02602938.2020.1787331

Wu, S., Rizoiu, M.-A., & Xie, L. (2018, June 25-28). *Beyond views: Measuring and predicting engagement in online videos.* Paper presented at the The 12th International Association for the Advancement of Artificial Intelligence (AAAI) Conference on Web and Social Media (ICWSM-18), California. https://ojs.aaai.org/index.php/ICWSM/article/view/15031

Yang, D., Wen, M., & Rose, C. (2014, July 4-7). *Peer Influence on Attrition in Massive Open Online Courses.* Paper presented at the The 7th International Conference on Educational Data Mining, London. http://www.cs.cmu.edu/~mwen/papers/edm2014-39.pdf

Yukselturk, E., Ozekes, S., & Türel, Y. K. (2014). Predicting dropout student: An application of data mining methods in an online education program. *European Journal of Open, Distance and E-Learning, 17*(1), 118-133. https://sciendo.com/article/10.2478/eurodl-2014-0008

Student Perceptions of Hybrid Courses in Higher Education

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Abstract
Online open-ended and closed-ended surveys were conducted in 2014-2016 among 191 students at a small, private university located in South Florida. Our main goals were to evaluate student perceptions of in-class and out-of-class assignments in hybrid courses, determine what students value most about these modes of learning, and recommend ways to maximize advantages and minimize disadvantages of each. We discovered that students value instant feedback and interacting with their peers when they are in class as in-class assignments were rated significantly higher than out-of-class assignments ($p < 0.05$) and higher ratings were significantly associated with responses associated with student-student interaction ($p < 0.05$). However, the time and place constraints of in-class work limits their ability to formulate their thoughts. Out-of-class assignments were appreciated for their flexibility of pace, time, and place, although students reported time-management problems as well. Like for in-class work, students valued the opportunity of reading their peers' answers as higher assignment ratings for out-of-class assignments were significantly associated with students' ability to read the responses of others. Although participants did not report an effect from specific learning differences, having to write for out-of-class work (as opposed to speaking in class) was reported as a hurdle. We discuss strategies for improving in-class and out-of-class assignments based on our study results.

Keywords: Hybrid learning, student perceptions, logistic regression, qualitative analysis

Hybrid courses, also referred to as blended learning, combine traditional in-class learning with online methods (Pazich et al., 2018). Traditional college classes meet two or three times a week, during which class discussions, lectures, and student presentations take place; traditional out-of-class assignments consist of reading texts and writing essays. In contrast, a hybrid course meets just once a week, or even once every two weeks (Caulfield, 2011), and combines online instruction with face-to-face class meetings (Graham, 2005). Out-of-class assignments can include online discussions, videotaped student presentations, or lectures posted by the instructor.

Benefits of Hybrid Courses

Hybrid courses take advantage of online learning while offering the anchor of regular in-class meetings. Hybrid courses can improve students' learning experience, encourage independent learning, and help solve classroom space issues (Doering, 2006; Jackson & Helms, 2008). The variety of teaching modes in hybrid courses also diversifies the learning pathways available to students to accomplish course tasks. Halverson and Graham (2019) show that this flexibility encourages curiosity and attention while also requiring more effort on the part of the learner. This combination is optimal for deep learning to occur outside the classroom, while the face-to-face class sessions "preserve the benefits of humanness" that students can miss in fully online courses (Halverson & Graham, 2019, p. 157).

Blending online learning strategies with face-to-face class time mitigates the main disadvantages of purely online courses: a lack of interaction between students and instructors and a heavy focus on technology (Jackson & Helms, 2008). Still, students benefit from moving materials out of the classroom: they spend less time and money on getting to class, are affected less by inclement weather, experience fewer barriers to interact with peers and instructors and find online coursework more flexible (Jackson & Helms, 2008). As students attend fewer in-person classes, the time they would otherwise have spent in class can instead be scheduled independently. This flexibility provides more freedom, both in time and space, than traditional courses (Erdem & Kibar, 2014). An excellent example of this is the video lecture. Students can watch the lecture when it suits them and set their own pace. Morgan (2014) explains that in-class lectures are often too fast for some students and too slow for others. Video lectures allow students to watch difficult portions multiple times and speed through content they grasp more quickly (Morgan, 2014).

Research has also shown that students consider hybrid courses beneficial. More than 80% of the participants in two separate studies indicated that they preferred blended courses to traditional ones (Sajid et al., 2016; Kiviniemi, 2014). Furthermore, Kiviniemi (2014) found that students in the study's blended course did better on the final exam than those in the traditional course. Sajid et al. (2016) found that students performed just as well on exam questions related to materials discussed outside the classroom as on questions related to topics covered in class. Participants in a study by O'Brien et al. (2011) received similar final grades, whether they were in the traditional or hybrid version of the course under study.

Finally, several meta-analyses conclude that students in hybrid courses modestly outperform those in traditional courses, with 60% of students in traditional courses scoring below the mean of those in hybrid courses (Owston et al., 2020). In fact, Bernard et al. (2014) found that hybrid learning has shown greater student achievement than either strictly online or face-to-face instruction. The integration of technology-based pedagogy in hybrid learning courses is an effective method of improving in person instruction as it may increase the quality of out-of-class

work/studying. Conversely, hybrid learning offers the opportunity for students to learn skills in person that they need to be successful in the online environment, skill requirements that may act as a barrier in strictly online courses (Bernard et al., 2014).

Time Management

However, drawbacks to hybrid courses do exist. While the independence of hybrid courses allows students freedom and convenience, it also requires them to manage their time effectively. Students in hybrid classes have the additional task of scheduling discussions, lectures, or presentations that would otherwise take place in a traditional classroom setting. Time management is an important skill, and students who master it are better prepared to tackle future endeavors, including in the workforce (Velasquez, 2012). However, lack of these skills is a significant barrier to success in online learning tasks (Kauffman, 2015). In fact, one of the significant challenges of hybrid courses identified by Aycock et al. (2002) is that students have limited time management skills. Meanwhile, university courses provide unique opportunities to develop and improve these key skills (Alvarez Sainz et al., 2019), and hybrid courses can play a major role here. In other words, time management is an opportunity as well as a challenge; managing one's own time can be liberating or scary, an opportunity or a barrier. However, because hybrids are anchored in a regular in-class meeting, students will not be entirely adrift.

Time management also connects with learning differences, especially for students with Attention Deficit Hyperactive Disorder (ADHD), deficits in executive functioning (EF) skills, or the ability to plan, organize, prioritize, and self-regulate behavior. Students who receive more time on tests can benefit from extra time on other assignments as well. Assignments done during class time are therefore limiting for them, while on out-of-class assignments, they can take as much time as necessary. Working online gives students who need expanded learning time more flexibility (Repetto et al., 2010). The flip side of this benefit is that students with ADHD or EF deficits have difficulty managing their time (Daley & Birchwood, 2010), so the out-of-class work may pose a more considerable challenge for them.

Technology

Using out-of-class and online teaching methods means that hybrid courses rely on technology more than traditional courses. Babb et al. (2010) note that student computer literacy can introduce a weakness in the hybrid course formula, as can the instructor's technological inexperience. Lederman (2019) explains that faculty members' level of comfort with educational technology is quite low. Just 39% of faculty in *Inside Higher Ed's* 2019 Survey of Faculty Attitudes on Technology responded that they "fully support" increased use of such technology (Lederman, 2019, para. 33).

For hybrid courses, instructors need to set up discussions and monitor them to make sure they do not go off-track. If video lectures are part of the out-of-class work, instructors need to develop skills to record and make them easily accessible for students. Course texts should be available electronically to download or print. Good hybrid instruction requires a user-friendly website or online learning management system and training for instructors on assignment design, online feedback, and online community building (Babb et al., 2010; Dziuban et al., 2005).

Students rely on technology for out-of-class coursework. In fact, university administrators worry that too much of the students' grades can depend on technology working properly (Jackson & Helms, 2008). In addition, not all students have internet access off-campus and may therefore need to travel to campus after all. Recently, 21% of first-year college students

described their internet connection as unpredictable, terrible, or nonexistent (Carrasco, 2021). Nonetheless, according to Jackson and Helms (2008), the benefits of hybrid learning outweigh the drawbacks. For example, their study showed that students were pleased to save time by not having to drive to campus and attend class, even though these time savings were reduced by technology issues and emailing the instructor with questions.

Hybrid Learning as a Solution

Online and hybrid education have been pivotal during the Coronavirus pandemic, allowing students to continue learning from home or in physically distanced classrooms. In response to the Covid-19 pandemic, higher education institutions implemented emergency health and safety policies to prevent the spread of SARS-CoV-2 (CDC, 2021). Preventative measures such as wearing masks, routine cleaning, increased ventilation, handwashing, screening, testing, contact tracing, and quarantining were quickly implemented (Centers for Disease Control and Prevention, 2021; U.S. Department of Education, 2021). To allow for physical distancing in classrooms, many institutions also reduced room occupancy using various hybrid learning models (Van Acht, 2021; Dorn et al., 2020), such as with students in the classroom for half the lessons and learning online the rest of the time.

This shift has not been without its challenges. Before the pandemic, nearly half of faculty had no prior online teaching experience and perceived online teaching as less effective compared to on-ground learning (Lederman, 2019). Educators' pre-pandemic perceptions were met with students' dissatisfaction with online instruction due to the expense and need for additional equipment, technological support, and a stable high-speed internet connection (Burke, 2021; McKenzie, 2020). The Covid-19 pandemic also highlighted the equity gaps in online learning. Students from underserved communities are disproportionately affected and challenges are compounded by a lack of the digital literacy and technology necessary to study in a remote setting (U.S. Department of Education, 2021).

One solution to increase engagement was the adoption of Zoom. This platform provided a virtual space for learners to interact with their professors in real-time. In a study by Ensmann et al. (2021), one student said they liked, "having all of us use Zoom and requiring that we share video to have us all be engaged" (Ensmann et al., 2021, p. 43). In the same study another student noted "My teacher also used Canvas to post PowerPoints during every class instead of teaching live. It was easier for me to learn with those PowerPoints. Zoom really gave me a headache" (Ensmann et al., 2021, p. 43). These comments illustrate the need for institutions to provide several methods of course interactions to meet the varying needs of learners.

As remote learning continues to improve, the hybrid model becomes a more viable option for learners and solves administrative concerns with scheduling and space. Xiao et al. (2021) describe hybrid education as flexible "in terms of time, space and pace of learning" (p. 1204), letting students balance offline, online, synchronous, and asynchronous modes of learning. Additionally, hybrid learning can "generate cost-savings from efficiencies in faculty classroom time, in reduced duplication of faculty lines and expertise, and in scheduling facilities" (Pazich et al., 2018, p. 46). As institutions reduce redundancies and overhead, they can focus on developing programming that "takes advantage of their strengths and helps differentiate themselves in a competitive marketplace" (Pazich et al., 2018, p. 46). All in all, there are many reasons to continue studying how to combine in-class and out-of-class assignments to optimize the student experience.

The 2013 introduction of the iPad for undergraduate students (see Unger et al., 2014) and the 2014 introduction of hybrid courses at our university provided an opportunity to evaluate student perceptions of in-class and out-of-class assignments in a hybrid course and how technology affected the students. Our research goal was to determine what students valued most about the different modes of hybrid coursework (in-class and out-of-class). In addition, we aimed to recommend ways to maximize the advantages and minimize the disadvantages identified by students of both in-class and out-of-class assignments.

Research Methods

Study Overview

The study took place over four consecutive semesters, starting in the fall semester of 2014 in two hybrid courses, taught by two instructors (Table 1). Across those courses, 70 students were enrolled. In both the spring and fall semesters of 2015, the study included two courses taught by different instructors, with a total of 45 students per semester. Finally, in the spring of 2016, one course with 31 students was surveyed.

The courses studied were at the 300 and 400 levels (junior and senior) in the university's writing-intensive core curriculum. The content and assignments of the courses differed, and the instructors also employed different in-class and out-of-class assignments. In the 300-level script analysis course, out-of-class assignments consisted of submitting written answers to questions about the scripts they read and collaborating on wiki pages that functioned as discussion boards, while in class, students discussed the plays' plots, genres, characters, and themes. In the 400-level project-based research course, students completed online discussion boards, peer-reviewed group presentations, and watched video lectures, whereas in class they practiced and discussed research ethics, methods, and data analysis. In the classrooms, students sat at individual desks that could easily be moved into small groups or a large circle for discussions. Blackboard was the Learning Management System used for out-of-class work, and the 300-level course also used a multi-touch iBook on the iPad.

A short questionnaire was administered five to twelve times per semester, with an average response rate of 27% (Table 1). Contributing factors to the response rate were conducting the survey at the end of class sessions, when students were eager to leave the room, and repeating the same survey multiple times, possibly making it less interesting for students to complete. The survey was voluntary, and both phases of the study were approved by the university's Internal Review Board (IRB). Permission to extend the study into the following semesters was also given by the IRB. The study consisted of two phases: exploratory and confirmatory.

Table 1
Participant Information

Variable	Fall 2014	Spring 2015	Fall 2015	Spring 2016
Courses	2	2	2	1
Enrolled students	70	45	45	31
Instructors	2	2	2	1
Weeks surveyed				
Survey 1	2-13	2-5		
Survey 2		7-8, 10, 12, 14	2, 4, 6-7, 9, 11	4-6, 8, 10
Number of responses	178	103	105	32
Response rate	21.2%	25.4%	38.9%	20.6%
Type of data collected	Qualitative	Quantitative & Qualitative	Quantitative	Quantitative

Phase One: Exploratory

The data for this study were collected using short, anonymous, online questionnaires using Google Forms. During the first semester and at the initial five points during the second semester of this study, the questions included a mix of six closed-ended and open-ended, short-answer questions (Table 1, Appendix A). Students rated the in-class and out-of-class assignments on a 1-5 scale and described both assignment modes' advantages or disadvantages. The open-ended character of the latter question allowed us to find out what the students liked and disliked about the teaching strategies without pre-formulating any categories.

At the start of the semester, students were provided with a consent form and an explanation of the study. Near the end of the class period, students were asked to fill out the questionnaire. Participation was voluntary, and for students to choose not to participate, the survey included two initial questions functioning as an exit ticket, an academically beneficial exercise (Akhtar & Saeed, 2020), addressing what the students had learned that week and what was most unclear. Students could then complete the rest of the survey, which was marked "for research purposes" and emphasized as voluntary.

Phase Two: Confirmatory

Based on the exploratory survey results, we identified several themes as to why students liked or disliked assignments. To confirm why students seemed to like and dislike in-class and out-of-class assignments, we administered a new survey starting in the spring 2015 semester. Students rated the in-class and out-of-class assignments and checked all the reasons they liked or disliked them (Appendix B). The confirmatory survey experiment was repeated in fall 2015 and spring 2016 to determine if the results were reproducible.

To determine if there was a significant difference in how students rated in-class and out-of-class assignments, a t-test ($p < 0.05$) was performed on the assignment ratings. In terms of determining which reasons were most abundantly cited for liking or disliking an assignment type (in-class or out-of-class) and how trends in like and dislike responses corresponded to how highly students rated assignments, a second method was employed. The data was divided into four analyses groups: in-class assignment ratings and corresponding like responses, in-class assignment ratings and corresponding dislike responses, out-of-class assignment ratings and corresponding like responses, and out-of-class assignment ratings and corresponding dislike responses. Within these analyses groups, students were sorted by how they rated in- and out-of-

class assignments. The number of students within each rating group who cited each reason was calculated. A binary logistic regression was performed on the data, with the assignment rating as the independent variable and whether the student selected a specific like or dislike (e.g., not enough time to formulate thoughts, feedback from peers, etc.) as the dependent variable. As a binary logistic regression was performed for each like or dislike response independently, a Bonferroni adjustment was applied to the p-value whereby the alpha (< 0.05) was divided by the number of logistic regressions for each of the four analyses groups. As there were 8 tests for the in-class and out-of-class likes analyses groups, this made the alpha 0.00625 for those analyses groups. As there were seven tests for the in-class and out-of-class dislikes analyses groups, this made the alpha 0.00714 for those analyses groups. Only logistic regressions with p-values less than the adjusted alphas were considered significant. The modeled probability of a student selecting a specific like or dislike based on their rating of the assignment was also calculated as part of the logistic regressions.

Results

Exploratory Data

From the qualitative data collected during the first phase of the study, eight distinct patterns emerged. These themes are based on the participants' written answers to the open-ended questions: "What was the advantage / disadvantage of doing this assignment outside class instead of in the classroom (in class instead of outside of class)?" Most of these themes encompass both positive and negative answers. For example, instant feedback was viewed as an advantage of being in class, while a lack of it was reported as a disadvantage of the out-of-class assignments.

The first theme is that students appreciate sharing with their peers in class. They hear their classmates' ideas and feel that their own views are heard by others. Instead of being stuck inside their own heads, they can solve assignments quickly with help from their peers. Additionally, students can try their own ideas out on their peers and validate them, without committing to them in writing for a discussion board or essay. Students wrote:

> We can bounce ideas off our peers and talk about aspects of characters our peers may have noticed.

> I was able to speak my mind where everyone can hear me.

> I learned the value of working with other classmates.

> I like how I can work with other people to find answers more quickly and share our own insights to gain a deeper understanding.

A related theme is that students show strong interest in being active in the classroom through hands-on learning. This hands-on learning focuses on engaging the students in activities, such as in-class research, peer-editing, short presentations, and data analysis. This active learning strategy contrasts with listening passively to a lecture. Students wrote:

> It's fun to see other student's presentations.

> We have to do it, we don't have a choice.

> I liked that Professor Simpson helped us get started.

I have learned that in writing we do make errors. We had an interesting peer share this week and I believe it was actually good to see mistakes and have someone else review and edit.

Another theme from the qualitative data is that some students prefer to talk in class, while others prefer to write outside of class. Some students thrive in an environment where they can quickly express their ideas and state these ideas orally. In contrast, other students prefer to take more time to formulate their thoughts, perfecting them before submitting them to be read. Some students prefer speaking in class and wrote:

Face to face discussions

Being able to have a verbal conversation about what was going on in all of our different lives and cultures

Other students prefer writing online, responding:

Better to just post what we have instead of shouting in class

We got more time to write our responses and explain ourselves

I like that I can do outside research before I submit my response.

I have more time to formulate my response.

Students also indicate that they enjoy receiving feedback. Indeed, students appear to crave feedback. This feedback can come from their instructor, but they also like receiving feedback from their classmates. Students wrote:

More input from students and more time with the professor for clarifying any confusion

Allows us to ask question

Being able to use examples from people in class

Disadvantage [of online] is there is no class discussion.

Another theme that appears in both positive and negative responses from students is the issue of time management. Students struggle with managing their time for the out-of-class coursework while at the same time enjoying the freedom to complete work whenever it suits them. On the other hand, students like that attending class forces them to be engaged and take care of their schoolwork, while they also feel frustrated by the rigidity of time and place of the in-class work. Students wrote:

You don't rely on yourself to do this on your own. in class you are required to do it in class

It is easier to do things in class and on a strict time schedule

Working independently outside of class has benefits and drawbacks. Students wrote:

Advantage: more time to complete it

Focus deeply in the reading on your own time instead of rushing into a certain time limit

I always forget

Having to wait for other students to turn their work in on time

Related to the "when" of in-class and out-of-class work is the "where": students indicate that having to be in the classroom is a drag while doing the out-of-class work wherever they want is a boon. They can select a location that specifically works for them and their learning style. Students wrote:

Having to be in class stead of home or wherever you want.

Was able to do it in a comfortable quiet place felt more relaxed [than] a classroom

that we can do research and watch the video calmly at home

An unanticipated pattern was that students value having the time to do additional research. This was primarily mentioned as an advantage of the out-of-class assignments. Because students can complete the out-of-class tasks at their own pace, they have more time for research than during more strictly timed exercises in class. Students wrote:

I liked doing my own research. This way I have a lot more time to work on the assignments out of class too.

Advantage: more time to research and look into the topic

We got to do our own research and put our own opinions in the discussion

Most of the out-of-class assignments used in the courses studied rely on technology, which sometimes causes issues for students. At times, videos do not play, websites do not respond, or log-in information does not work, causing frustration and even preventing students from doing the work at all. In addition to specific issues like these, some students are simply uncomfortable using technology for coursework. Students wrote:

I don't like to use the iPad or a lot of technology and I learn and can connect more in class.

The disadvantage is […] relying on technology to work all the time

I'd prefer to do this in class because of the technology use, which took more time than the assignment itself

Confirmatory Data

Averages and standard error of the assignment ratings for the confirmatory phases of the study (spring 2015, fall 2015, and spring 2016) are shown in Figure 1. In-class assignments were rated higher than out-of-class assignments every semester, and the difference was either significant ($p < 0.05$) or highly significant ($p < 0.01$). The closed-ended responses developed from the exploratory phase are shown in Table 2.

Figure 1

Average Assignment Ratings for In-Class and Out-of-Class Assignments for the Spring 2015, Fall 2015, and Spring 2016 Semesters with Their Standard Error. Stars Denote Significance
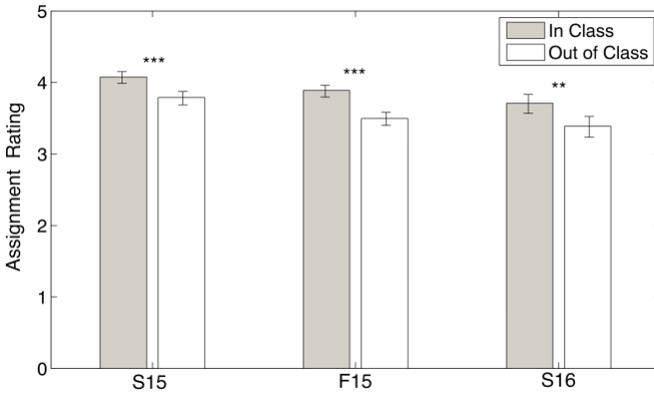
Differences, *** < 0.01, ** < 0.05.

Table 2

Like and Dislike Responses Students Could Pick for Liking and Disliking In-Class and Out-of-Class Assignments on the Surveys

"Like" Options	"Dislike" Options
In Class Assignments	
Being able to ask questions in real time	Not enough time for the assignment
Instant feedback from the professor	Speaking instead of writing
Speaking instead of writing	Working in groups
Live discussion	Having to be in class
Learning from peers	Not able to do extra research
Working in groups	Not able to formulate my thoughts
Hands-on work	Nothing
Nothing	
Out of Class Assignments	
Work at my own pace	Difficult to manage time
Work when it's convenient for me	No instant feedback from professor
Working in my preferred location	No feedback from peers
Read other student's answers	Trouble with technology
Writing instead of speaking	Writing instead of speaking
Doing extra research	Difficulty meeting with team
Not having to go to class	Nothing
Nothing	

Percentages of like and dislike responses chosen by students grouped by assignment rating and significance results of the logistic regressions are shown in Figure 2. The most commonly selected likes of in-class assignments among all students were "learning from peers" (65%), "working in groups" (52%), and "live discussion" (49%). Only significant positive regressions (students who rated an assignment higher were more likely to select a specific like) were identified in the in-class likes. The significant responses were "learning from peers,"

"working in groups," "live discussion," and "hands-on work." The most commonly selected dislikes of in-class assignments were "nothing" (47%), "having to be in class" (23%), and "not enough time for the assignment" (22%). One significant negative regression response was identified (students who rated the assignment lower were more likely to select a specific dislike). The only significant dislike response was "not able to formulate my thoughts."

Figure 2
Percentage of Students That Selected a Specific In-Class Assignments "likes" (A) and "dislikes" (B), and Out-of-Class "likes" (C) and "dislikes" (D).
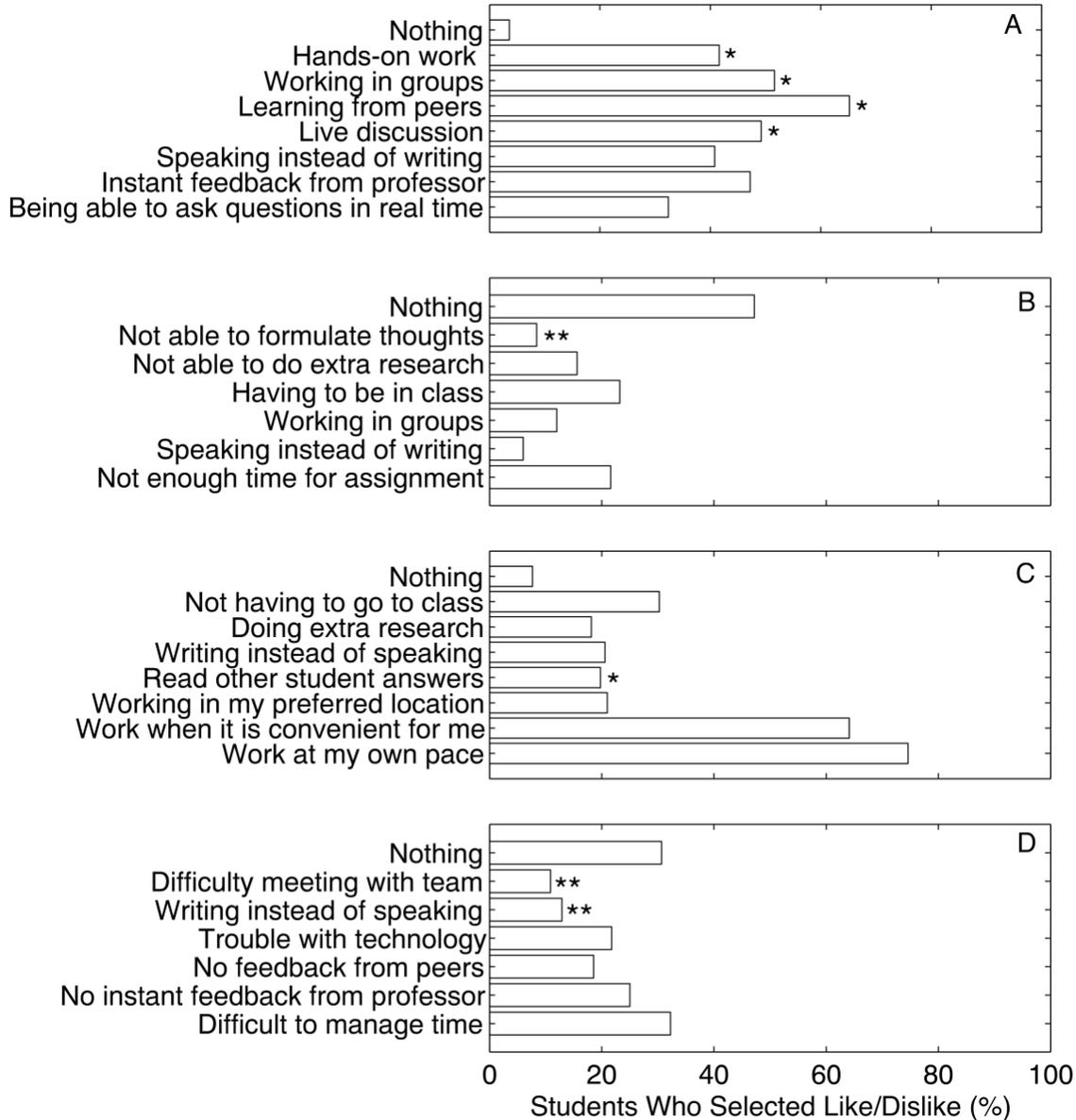
Note. Stars indicate significant logistic regression results. One star indicates a positive regression, students who rated the assignment higher were more likely to select that response. Two stars indicate a negative logistic regression, students who rated the assignment lower were more likely to select that response.

The most commonly selected like response for out-of-class assignments were "work at my own pace" (75%), "work when it's convenient for me" (64%), and "not having to go to class" (30%). One significant positive regression response was identified as "read other students' answers." The most commonly selected dislikes for out-of-class assignments were "difficult to manage time" (32%), "nothing" (31%), and "no instant feedback from the professor" (25%). The two significant negative regression responses were identified as "writing instead of speaking" and "difficult meeting with team." Each of these significant results are supported by the modeled probabilities of students within a rating group selecting a specific response (tables in Appendix C).

Discussion

Overall Trends

The overall trends of the response data provide insights into how students perceive the benefits and costs of in-class and out-of-class assignments. As these hybrid courses met just once a week, the instructors initiated several activities involving students talking to each other during physical class time. This gave them opportunities to share what they have come up with on their own and build on the ideas offered by other students. The students' preference for these activities is shown in the confirmatory data. The most commonly selected like responses for in-class assignments all revolved around students interacting with other students (e.g., "learning from peers," "working in groups," etc.). Over half of the students chose these two responses indicating these likes were more commonly selected than not and driven by the group as a whole instead of a few individuals. This type of student interaction is more difficult to foster in the online environment but given the magnitude of the students who selected these like responses of in-class assignments, developing online assignments that mimic in-class peer interaction will benefit student perceptions of hybrid learning.

Regarding the dislike responses of in-class assignments, the most commonly selected response was "nothing," with almost half the students choosing solely this response. This indicates many students are content with the traditional in-class model. "Having to be in class" (23%) and "not enough time for the assignment" (22%) were the next two most commonly selected dislike responses. "Having to be in class" links to the more convenient format of online learning, whereby students can more easily fit the online portions of the class into their schedules. "Not enough time for the assignment" hits at a more complex pedagogy issue. Not all students learn at the same speed, and the in-class assignments force slower students to keep pace with the class, possibly at the expense of truly understanding the lesson the assignment is trying to teach. As almost a quarter of respondents selected this response; a sizable part of the sample experienced being forced into a timed environment as detrimental. The fact that students value a release from these time constraints is reflected in the out-of-class like response data as the most commonly selected response was "work at my own pace" (75%). A much larger percentage of students selected "work at my own pace" as a like of the online assignments than students who selected "not enough time for the assignment" in the in-class assignment, indicating that some students preferred to move at a faster pace than was provided in class.

The rest of the common responses have to do with the convenience of the online environment. The second most commonly selected like response for online learning was "work when it is convenient for me" (64%), which also has a corollary within the dislike responses of

in-class assignments as "having to be in class." Clearly, students value the flexibility of learning on their own terms, including when they feel most ready to tackle the course content. However, there is a tradeoff with online assignments. The most commonly selected dislike response of in-class assignments was "difficult to manage time" (32%). Students like the online format because they can learn at their own pace, but a third of the sample found it challenging to self-assess how much time they would need for or when they should work on an out-of-class assignment. Time management issues may be especially relevant for students with learning differences that hamper their ability to focus and plan. These students can take advantage of extended time for out-of-class work but may have trouble prioritizing or remembering assignments. If they don't remember to do the work or put it off until the last minute, having extended time is no longer a benefit. In that case, the restrictions and structure of in-class work can be a boon: the time is partitioned up for the students, and all the student needs to do is show up, sit down, and follow instructions. Time management issues were not a problem for all students in the samples, however, as the second most commonly selected response for out-of-class dislikes was "nothing" (31%), indicating about a third of the respondents felt at ease in the online environment.

Every possible like and dislike response was selected even if it was not among the most obvious trends previously discussed. These trends include students' value of feedback from their professor, trouble with technology, working in their preferred location, and the desire to conduct additional research outside of class.

Both our study and previous studies (Jackson & Helms, 2008) show that students value the convenience of work outside of class, although our students mainly focused on the downside of having to be in class rather than having trouble getting there. Nonetheless, this study confirms that some students indeed dislike having to come to and be in class. Previous studies also indicate the benefits of working at one's own pace and at a preferred time and place (Erdem & Kibar, 2014; Morgan, 2014). Students in our study overwhelmingly confirmed that these were benefits of the out-of-class assignments. Participants in our study also confirmed previous studies (Aycock et al., 2002; Kauffman, 2015), showing that time management posed a difficulty for online work, although they did not specify whether learning differences were at the root of these difficulties. Underlying learning differences may also be at the core of our participants' dislike of writing required for out-of-class assignments. Here, too, our participants did not make this explicit. Finally, issues with technology (Babb et al., 2010; Jackson & Helms, 2008) were also invoked by our study's participants, but in the quantitative phase of the study, these issues were not chosen often, nor were they a major factor in whether students disliked out-of-class work.

Trends by Ratings

Trends in the logistic regression highlight aspects of in-class and out-of-class assignments that should be modified to increase student engagement. All of the responses that were positively correlated with assignment ratings (students who rated the assignment higher were more likely to select these responses) had to do with student-to-student interaction. These significant responses in-class were "hands-on work," "working in groups," "learning from peers," and "live discussion," and out-of-class was "read other students' answers." Conversely, assignment responses that were negatively correlated with assignment ratings (students who rated the assignment lower were more likely to select these responses) in-class were "not able to formulate thoughts," and out-of-class were "difficulty meeting with team" and "writing instead of speaking." The latter two of these three dislike responses were also related to peer

interactions. Students again highlighted their preferences to speaking with each other instead of writing their assignments, although some find it difficult to meet with other members of their group. Thus, ways to increase the engagement of students who rated these out-of-class assignments lower will involve increasing peer interaction among students.

Any changes in the formatting of assignments in hybrid classes that increase peer interactions will also need to be balanced with allowing students enough time to participate at their own pace and the course's learning objectives. For example, increasing in-class peer interactions by creating more in-class assignments causes stricter time constraints, an issue for many students. Increasing peer interactions outside of the classroom is another option, but several students indicated that meeting with their peers was difficult. So, any increase in out-of-class peer interactions needs to be sufficiently structured to ensure that non-active peers do not burden students. Another issue of balance includes the negatively correlated response "writing instead of speaking." While reducing the writing and increasing the speaking would increase students' opinion of the out-of-class assignments, it is not consistent with the learning objectives of these courses. Both courses were-writing intensive and had writing skills as learning objectives. Therefore, moving writing assignments to live discussions to increase student engagement is at odds with the course content for these specific classes. The abundance of this response also highlights the importance of the flexibility inherent in hybrid courses: it does not rely just on oral participation or just on written participation, but on equal helpings of both. If students are weaker at communicating orally, they can make up for that weakness in their written assignments while still being challenged in the classroom to keep improving their speaking skills. Other students, who shine in an oral classroom setting, are not handicapped by an all-written environment such as in many purely online courses. Instead, those students can score points during in-class discussions and activities while practicing writing skills as well.

Recommendations

Hybrid courses will continue to become more common, either out of necessity (saving limited classroom space with increasing enrollment numbers, physical distancing during Coronavirus flareups) or for convenience (saving students' time spent commuting and, in the classroom). Given the results of this study, we can provide recommendations on implementing hybrid curricula without sacrificing learning objectives. In other words, how can faculty members optimize the in-class sessions, while maximizing learning —and minimizing frustration—for out-of-class assignments?

The study participants often indicated that they valued feedback from their instructor but especially from their peers. When designing assignments for both in-class and out-of-class, it is essential to take this into account. Students enjoy live discussions, which allow them to hear their peers' views and express their own. In addition, students like collaborating with their classmates, working in groups to complete in-class assignments. Based on this feedback, it is crucial to include in-class activities that maximize student interaction in the classroom. Additionally, in-class assignments that allow the instructor to provide immediate feedback use the limited in-class time effectively. One method of increasing peer interaction outside the class is increasing the use of discussion boards and group video conferencing. Discussion boards allow students to take their time to synthesize information and formulate a response. Creating deadlines for responses in discussion boards ahead of the next in-class session will ensure students have time to view and contemplate other student responses before returning to class. Students can log their response as a video instead of in written format. While students like to "read responses from other students,"

we did not include the option of *watching* responses from other students. It is unclear whether, if students could view recorded contributions from other students, that would suffice for reading other student responses. If the issue is a time issue, in that students like to read responses because they can read them slowly to digest them or as many times as they like, a discussion based on video clips might substitute. It would also alleviate the negative of "writing instead of speaking." Therefore, students still interact with their peers, but on a longer time scale than a strict class period. Alternatively, when working in groups, the instructor can require groups before they leave the class session to set standing appointments outside of class for video conferences to work on group assignments. Therefore, students will still be able to work in their preferred environment, with more flexibility in time, but will have the structure needed for a group activity to be successful. Having students set their meetings in class would also help with time management as students cannot keep putting off working on an assignment.

A solution to the major issue highlighted by students with in-class assignments—"not enough time for the assignment"—is to allow students to continue their in-class assignments outside of class on their own time. Thus, students may be required to start an assignment in-class where they can take advantage of peer interaction and feedback but have the option to finish the assignment out-of-class. The last recommendation deals with the issue of time management raised by students concerning out-of-class assignments, which was shown to be a benefit as well as a drawback of hybrid learning. Completing work individually outside of the classroom provides students the freedom to work when and for how long they want on a required task. They can time their work when they feel most motivated to complete it, and they can speed through easy parts while doing additional research for the more difficult sections. It is, therefore, essential to allow students enough time to start and finish their work by sending out the assignment several days before it is due. Another recommendation is to list the expected amount of time required for most students to complete it in the assignment description. Although students need to understand whether they typically take more or less time than the recommended completion time, even if they are unaware of where they stand regarding this benchmark at the beginning of the semester, they will develop some idea during the semester. Sending out reminders is also helpful since students indicate that they forget to do the work, losing all the benefits of the course's flexibility.

Regarding the major like and dislike responses, some participants in this study indicated that they felt challenged by the course's format and the technological requirements. Because much of the out-of-class work relies on technology, less computer-literate students were at a disadvantage. This means that it is vital to spend time familiarizing students with programs, apps, and websites the course will use. For example, when assigning an out-of-class video lecture, the instructor can ask the students to navigate to the video and make sure it plays while they are still in the classroom. This will give students confidence and prevent questions and confusion later in the week.

We also have recommendations that address the less frequently selected like and dislike responses. In-class assignments should be designed so instructors can quickly assess them as correct or incorrect to increase instructor feedback. This allows instructors to give fast and straightforward feedback as they walk around the room. As for the freedom of allowing students to learn where and when it is convenient for them, the hybrid model is already well adapted. Some students thrive in the stimulating classroom environment where they receive instructor feedback and input from peers, while others experience that same environment as distracting or "shouting in class." For those students, the hybrid format allows them to spend half the time

usually spent in class in a less distracting environment of their own choice. Aside from this issue of choosing one's own location to learn, the hassles of having to be in class involve commuting and time management: leaving on time, arranging other events around class times, refusing hours at a part-time job. When looking at being in class from the students' perspective, it takes a lot longer than the 75 minutes spent in the classroom. The preference for completing additional research is also already well adapted in the hybrid model. Students can be encouraged to do research, either individually or in groups, and time in-class can be set aside for this component. Additionally, out-of-class assignments can include specific instructions that encourage students to do more research, sending them in the direction of reliable sources.

Limitations

This study has limitations that need to be considered when interpreting the results. First, this study was based on courses taught by two instructors, making the sample quite small. In addition, the instructors monitored the data collected during the semester and adjusted their teaching style to the feedback. This may have affected the data subsequently collected. Also, the same students were surveyed several times during each semester, meaning that each participant was represented multiple times in the data. Finally, the participants were students at a small, private university with special facilities for students with learning differences. Thus, even though participants did not refer to learning differences affecting their perception of course assignments, this may have affected the results, and a similar study at a different university may yield different outcomes.

We suggest, therefore, that similar research is conducted at larger as well as public universities interested in learning the students' perceptions of hybrid courses. Variations in classroom facilities and online learning management systems may affect students' perceptions and experiences. Also, by collecting data from different courses with more varied in-class and out-of-class assignments, students' likes and dislikes can be linked more clearly to specific coursework. Another way to link student perceptions to specific coursework is by creating online and face-to-face versions of the same assignment. This will be valuable for developing future hybrid courses, allowing instructors to choose which work to assign in-class and out-of-class.

Conclusion

This study found that students in the hybrid courses evaluated consistently rated in-class assignments higher than out-of-class assignments. Statistical analyses indicated that this is primarily due to peer-to-peer and peer-to-instructor interaction such as direct feedback, discussions, and group activities. However, some students mentioned not having enough time to form their thoughts. Conversely, in out-of-class assignments, students like reading other students' submissions in the online discussion environment, which allows them to digest other students' ideas and formulate a response at their own pace. The drawbacks of out-of-class assignments reported by some students are that they prefer speaking to writing and that effectively managing their time is challenging. For instructors to make the most of the hybrid format, they should maximize peer-to-peer interaction and opportunities for instant feedback. Outside the classroom, we recommend designing assignments that facilitate peer-to-peer exchanges and for which the instructor can easily and quickly provide feedback. These online assignments include written discussion boards, video discussions, and scheduled group work. For example, instructors could have students set their meeting times before leaving class. Outside-the-class group work can take advantage of video meeting technology, enabling students to

collaborate from their preferred location. Additionally, instructors can work with their students to develop time management skills by sending reminders, creating a work schedule, and setting staggered deadlines.

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The authors declared no conflicts of interest.

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References

Akhtar, M., & Saeed, M. (2020). Assessing the effect of agree/disagree circles, exit ticket, and think - pair - share on students' academic achievement at undergraduate level. *Bulletin of Education and Research*, *42*(2), 81–96.

Alvarez Sainz, M., Ferrero, A. M., & Ugidos, A. (2019). Time management: Skills to learn and put into practice. *Education & Training, 61*(5), 635-648. http://dx.doi.org/10.1108/ET-01-2018-0027

Aycock, A., Garnham, C., & Kaleta, R. (2002). *Lessons Learned from the Hybrid Course Project*. Teaching Scholars Forum. https://hccelearning.files.wordpress.com/2010/09/lessons-learned-from-the-hybrid-course-project.pdf

Babb, S., Stewart, C., & Johnson, R. (2010). Constructing communication in blended learning environments: Students' perceptions of good practice in hybrid courses. *Journal of Online Learning and Teaching*, *6*(4), 735–753.

Bernard, R. M., Borokhovski, E., Schmid, R. F., Tamim, R. M., & Abrami, P. C. (2014). A meta-analysis of blended learning and technology use in higher education: From the general to the applied. *Journal of Computing in Higher Education*, *26*(1), 87–122. https://doi.org/10.1007/s12528-013-9077-3

Burke, L. (2021, Jan 22). *Survey outlines student concerns 10 months into pandemic*. Inside Higher Ed. www.insidehighered.com/news/2021/01/22/survey-outlines-student-concerns-10-months-pandemic

Carrasco, M. (2021, August 25). *First-year students struggled with online learning last year*. Inside Higher Ed. https://www.insidehighered.com/news/2021/08/25/first-year-students-struggled-online-learning-last-year

Caulfield, J. (2011). *How to design and teach a hybrid course : Achieving student-centered learning through blended classroom, online and experiential activities*. Stylus Publishing.

Centers for Disease Control and Prevention. (2021). *Guidance for institutions of higher education (IHEs)*. https://www.cdc.gov/coronavirus/2019-ncov/community/colleges-universities/considerations.html

Daley, D., & Birchwood, J. (2010). ADHD and academic performance: why does ADHD impact on academic performance and what can be done to support ADHD children in the classroom? *Child: Care, Health And Development*, *36*(4), 455–464.

Doering, A. (2006). Adventure learning: Transformative hybrid online education. *Distance Education*, *27*(2), 197–215.

Dorn, E., Panier, F., Probst, N., & Sarakatsannis, J. (2020). *Back to school: A framework for remote and hybrid learning amid COVID-19*. McKinsey & Company. https://www.mckinsey.com/industries/education/our-insights/back-to-school-a-framework-for-remote-and-hybrid-learning-amid-covid-19

Dziuban, C., Hartman, J., Juge, F., Moskal, P., & Sorg, S. (2005). Blended learning enters the mainstream. In C. J. Bonk, & C. R. Graham (Eds.), *The handbook of blended learning : Global perspectives, local designs,* (pp. 380-403). Center for Creative Leadership.

Ensmann, S., Whiteside, A., Gomez-Vasquez, L., & Sturgill, R. (2021). Connections before curriculum: The role of social presence during COVID-19 emergency remote learning for students. *Online Learning Journal, 25*(3), 36-56. http://dx.doi.org/10.24059/olj.v25i3.2868

Erdem, M., & Kibar, P. N. (2014). Students' opinions on facebook supported blended learning environment. *TOJET : The Turkish Online Journal of Educational Technology*, *13*(1), 199–206.

Graham, C. R. (2005). Blended learning systems: Definition, current trends, and future directions. In C. J. Bonk, & C. R. Graham (Eds.), *The handbook of blended learning: Global perspectives, local designs,* (pp. 63-95). Center for Creative Leadership.

Jackson, M. J., & Helms, M. M. (2008). Student perceptions of hybrid courses: Measuring and interpreting quality. *Journal of Education for Business*, *84*(1), 7–12.

Kauffman, H. (2015). A review of predictive factors of student success in and satisfaction with online learning. *Research in Learning Technology*, *23*.

Kiviniemi, M. (2014). Effects of a blended learning approach on student outcomes in a graduate-level public health course. *BMC Medical Education*, *14*(47), 1–7.

Lederman, D. (2019, October 30). *Professors' slow, steady acceptance of online learning: A survey*. Inside Higher Ed. https://www.insidehighered.com/news/survey/professors-slow-steady-acceptance-online-learning-survey

McKenzie, L. (2020, May 27). *Ramping up for remote instruction*. Inside Higher Ed. www.insidehighered.com/news/2020/05/27/new-resources-help-support-faculty-quality-online-instruction

Morgan, H. (2014). Flip your classroom to increase academic achievement. *Childhood Education*, *90*(3), 239–241.

O'Brien, C., Hartshorne, R., Beattie, J., & Jordan, L. (2011). A comparison of large lecture, fully online, and hybrid sections of introduction to special education. *Rural Special Education Quarterly*, *30*(4), 19–31.

Owston, R., York, D. N., Malhotra, T., & Sitthiworachart, J. (2020). Blended learning in STEM and non-STEM courses: How do student performance and perceptions compare? *Online Learning Journal, 24*(3), 203-221.

Pazich, L. B., Kurzweil, M., & Rossman, D. (2018). Hybrid learning and the residential liberal arts experience. *Change: The Magazine of Higher Learning*, *50*(6), 45–51.

Repetto, J., Cavanaugh, C., Wayer, N., & Liu, F. (2010). Virtual high schools: Improving outcomes for students with disabilities. *Quarterly Review of Distance Education*, *11*(2), 91–104.

Sajid, M. R., Laheji, A. F., Abothenain, F., Salam, Y., AlJayar, D., & Obeidat, A. (2016). Can blended learning and the flipped classroom improve student learning and satisfaction in Saudi Arabia? *International Journal Of Medical Education*, *7*, 281–285.

Unger, S., Simpson, C., & Goudreau, S. B. (2014). iPad Mini revolution at Lynn University: A faculty perspective. *Long Island Education Review, 13*(1), 30–33. http://www.scopeonline.us/pdf/SCOPE-LI-EdReview-Spring14.pdf

U.S. Department of Education. (2021). *ED COVID-19 Handbook. Strategies for Safe Operation and Addressing the Impact of COVID-19 on Higher Education Students, Faculty, and Staff*. https://www2.ed.gov/documents/coronavirus/reopening-3.pdf

Van Acht, D. (2021, August 30). Hoger onderwijs opent hybride: 'Niemand wordt verplicht om naar college te komen' [Higher education opens in hybrid mode: 'Nobody is required to come to class']. *Het Parool*. https://www.parool.nl/amsterdam/hoger-onderwijs-opent-hybride-niemand-wordt-verplicht-om-naar-college-te-komen~b21c573f/

Velasquez, T. B. (2012). "Hybrid method" an integrated pedagogical method for EFL teaching and learning. *Zona Próxima*, *17*.

Xiao, J., Sun-Lin, H.-Z., Lin, T.-H., Li, M., Pan, Z., & Cheng, H.-C. (2020). What makes learners a good fit for hybrid learning? Learning competences as predictors of experience and satisfaction in hybrid learning space. *British Journal of Educational Technology*, *51*(4), 1203–1219.

Appendix A

Survey 1

Evaluation. * Required

What did you learn this week? (Open-ended)
What is still most unclear this week? (Open-ended)

QUESTIONS BELOW ARE FOR RESEARCH PURPOSES

Please fill the following questions out. Your participation is voluntary, and you will contribute to research about learning techniques. Please refer to the consent form for more information.

This week's in-class assignment: Analysis of marijuana discussion board

How would you rate this week's in-class assignment?

1   2   3   4   5

Not at all interesting   Very interesting

What was the advantage / disadvantage of doing this assignment in class instead of online? (Open-ended)

Would you have preferred to do this assignment online?

- Yes
- No
- No preference

This week's out-of-class assignment: PHRP certificate

How would you rate this week's out-of-class assignment?

1   2   3   4   5

Not at all interesting   Very interesting

What was the advantage / disadvantage of doing this assignment outside class instead of in the classroom? (Open-ended)

Would you have preferred to do this assignment in the classroom?

- Yes
- No
- No preference

Appendix B

Survey 2

Evaluation

* Required

What did you learn this week? (Open-ended)

What is still most unclear this week? (Open-ended)

QUESTIONS BELOW ARE FOR RESEARCH PURPOSES

Please fill the following questions out. Your participation is voluntary, and you will contribute to research about learning techniques. Please refer to the consent form for more information.

This week's in-class assignment

How would you rate this week's in-class assignment?

1   2   3   4   5

Not at all interesting   Very interesting

What did you LIKE about doing this assignment in class instead of outside class?

Check all that apply.

- Learning from peers
- Instant feedback from professor
- Speaking instead of writing
- Live discussion
- Working in groups
- Being able to ask questions in real time
- Hands-on work
- Nothing
- Other:

What did you DISLIKE about doing this assignment in class instead of outside class?

Check all that apply.

- Not enough time to for the assignment
- Speaking instead of writing
- Working in groups
- Having to be in class
- Not able to do extra research
- Not able to formulate my thoughts
- Nothing
- Other:

Would you have preferred to do this assignment online?

- Yes
- No
- No preference

This week's out-of-class assignment

How would you rate this week's out-of-class assignment?

If you did not do the out-of-class assignment, please leave this question blank and write "did not complete" under "other" of the next question.

1   2   3   4   5

Not at all interesting   Very interesting

What did you LIKE about doing this assignment outside class instead of in the classroom?

Check all that apply.

- Work at my own pace
- Work when it's convenient for me
- Working in my preferred location
- Read other students' answers
- Writing instead of speaking
- Doing extra research
- Not having to go to class
- Nothing
- Other:

What did you DISLIKE about doing this assignment outside class instead of in the classroom?

Check all that apply.

- Difficult to manage time
- No instant feedback from professor
- No feedback from peers
- Trouble with technology
- Writing instead of speaking
- Difficulty meeting with team
- Nothing
- Other:

Would you have preferred to do this assignment in the classroom?

- Yes
- No
- No preference

Appendix C
Supplementary Material Tables

Table C1

Probabilities a Student Would Choose Each Like Based on Their Rating of the In-Class Assignment

	1	2	3	4	5
Being able to ask questions in real time	0.18	0.22	0.27	0.32	0.38
Instant feedback from professor	0.23	0.30	0.38	0.47	0.57
Speaking instead of writing	0.19	0.25	0.33	0.41	0.50
Live discussion	0.14	0.23	0.35	0.50	0.64
Learning from peers	0.16	0.29	0.48	0.67	0.82
Working in groups	0.10	0.19	0.34	0.52	0.70
Hands on work	0.01	0.17	0.27	0.42	0.57
Nothing	0.29	0.14	0.06	0.03	0.01

Table C2

Probabilities a Student Would Choose Each Dislike Based on Their Rating of the In-Class Assignment

	1	2	3	4	5
Not enough time for assignment	0.37	0.31	0.53	0.21	0.17
Speaking instead of writing	0.13	0.01	0.01	0.01	<0.01
Working in groups	0.34	0.24	0.17	0.11	0.07
Having to be in class	0.35	0.30	0.27	0.23	0.20
Not able to do extra research	0.12	0.13	0.14	0.16	0.17
Not able to formulate thoughts	0.50	0.29	0.14	0.07	0.03
Nothing	0.23	0.26	0.30	0.34	0.38

Table C3

Probabilities a Student Would Choose Each Like Based on Their Rating of the Out-Of-Class Assignment

	1	2	3	4	5
Work at my own pace	0.57	0.64	0.71	0.77	0.83
Work when it's convenient for me	0.42	0.51	0.60	0.68	0.75
Working in my preferred location	0.31	0.27	0.23	0.20	0.17
Read other students' answers	0.04	0.07	0.13	0.22	0.36
Writing instead of speaking	0.39	0.34	0.28	0.23	0.19
Doing extra research	0.23	0.23	0.23	0.23	0.22
Not having to go to class	0.50	0.42	0.34	0.27	0.21
Nothing	0.25	0.16	0.09	0.05	0.03

Table C4

Probabilities a Student Would Choose Each Dislike Based on Their Rating of the Out-Of-Class Assignment

	1	2	3	4	5
Difficult to manage time	0.40	0.37	0.34	0.31	0.28
No instant feedback from professor	0.26	0.26	0.25	0.25	0.24
No feedback from peers	0.16	0.17	0.18	0.19	0.20

Trouble with technology	0.15	0.17	0.2	0.23	0.26
Writing instead of speaking	0.60	0.35	0.16	0.07	0.02
Difficulty meeting with team	0.34	0.22	0.13	0.08	0.04
Nothing	0.26	0.28	0.30	0.31	0.33

Systematic Mapping of the Social Construction of Learning (2015-2020): Challenges for Online Learning Environments

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Abstract
The purpose of this study is to identify and characterize the state of social construction of learning in virtual communities within online learning environments and to identify the advances and research challenges of social learning. The method was a systematic mapping to analyze the evidence published on the topic in 2015-2020. We automatically searched the Scopus and Web of Science databases, applying inclusion and exclusion criteria to obtain the maximum relevant information. The pre-designed search strategy resulted in 187 articles. The main research topic addressed in most of these is learning as a social construction in training contexts, primarily virtual communities. In higher education, the United States is the country with the most active researchers on this topic. In addition, the most significant findings show that in a virtual learning community, social and cognitive interactions with teaching presence are crucial for students to build knowledge and achieve a higher level of learning. This study describes challenges related to the various methodologies, geographical scope, and types of social construction learning in virtual learning communities. This research is intended to be of value to teachers, decision-makers, designers of research and researchers interested in the social construction of learning in online learning environments.

Keywords: Social construction of learning, virtual learning communities, social interaction, educational innovation, higher education.

The dynamics of learning in contemporary societies create possibilities for new scenarios and challenges in many areas of education. To overcome educational challenges, the 2030 Agenda for Sustainable Development (Sanahuja & Tezanos Vázquez, 2017) establishes goals that significantly impact the development of education (UNESCO, 2017), specifically the fourth goal is related to quality education. As a contribution to the academic field, this research analyzed the social construction of learning in online learning environments, which is essential to promote active citizenship and where people who identify with specific communities can find support for their training and respond to global challenges through learning (IESALC-UNESCO, 2021). Also, community-based organizations play primary roles in empowering education and organizing learning activities (Noguchi et al., 2018). Thus, a community approach to learning helps people redefine, reevaluate, and promote shared knowledge and learning.

As a producer of knowledge and technology, the university is called upon to make fundamental contributions to social dynamics, such as training through online courses that promote learning through social interaction. According to the International Institute for Higher Education in Latin America and the Caribbean of the United Nations Educational, Scientific and Cultural Organization (IESALC-UNESCO, 2021), the offer of training of higher education must be socially relevant and aim to form knowledge societies that are inclusive, diverse, and multidisciplinary. Furthermore, they must generate authentic correspondence among academic and social groups and create host spaces for dialogue, discussion (Quintana et al., 2021), and dissemination, focusing on sustainable human development with social vision, relevance, research and innovation (Cajiao, 2017). Therefore, eLearning must use a humanistic model with responsible interactions as an essential element of learning (García-Peñalvo & Seoane Pardo, 2015). In this way, it is possible to achieve practical online training environments that facilitate university transformations to meet the challenges of the 21st century.

Technological growth and development, which supports educational training, are constantly evolving realities in society and can promote knowledge and learning in a relevant way the knowledge society. The digital world relies on communication skills for the social construction of learning in the knowledge society (Escardíbul & Mediavilla, 2016; Souviron-López, 2018) and thus, the announcements, communication/email, evaluations, grades, debates, and other tasks or activities that promote interaction are pedagogically integrated (Haubrick et al., 2021). Therefore, ongoing reflection is necessary regarding the challenges that arise in online learning environments for the development of new pedagogical proposals based on socially constructed learning (Gonzalez & Ozuna, 2021) where technology is recognized as a resource that can promote and expand learning in a ubiquitous way (González-Sanmamed et al., 2019) and where students can improve their skills to handle multiple topics through relationships with others through dialogic interactions, collaborations, debates, and information sharing (Yulianto et al., 2016). Hence, interactive and collaborative relationships make it easier for students to carry out activities they cannot manage alone.

The persistent advance of online learning platforms has led to changes in, and reflection about, educational approaches. Online learning environments that create teaching and learning proposals by combining conventional methods with innovative methods increase the accessibility and efficiency of the education system (Shukla et al., 2020). One challenge is addressing online training needs for students aimed at large and diverse student populations (Galoyan et al., 2021). Another challenge is to develop training where students are builders of knowledge and not merely knowledge recipients of a purely instructional pedagogy (Dron & Ostashewski, 2015). In addition, in the face of unprecedented situations such as the COVID-19 pandemic, educational institutions have understood the urgency of preparing for online learning (Ensmann et al., 2021) because they were forced to implement or strengthen online

learning systems and programs (Alwafi, 2022) as a means to acquire knowledge and skills (Elshareif & Mohamed, 2021). Such considerations explain why research on the social construction of learning has become more relevant.

The social construction of learning is continuously developed through the interaction of participants, understood as learning from others, through social interaction (Johnson & Johnson, 2014; Lind et al., 2019) when the synchronous and asynchronous communication tools in online learning environments allow teachers to observe the exchanges of messages between active students, evaluate and infer whether or not the different concepts and lessons are understood, observe the discourse, and decide when to intervene to support student learning. According to a review study, high levels of collaboration and dialogue go hand in hand with social learning (Flood et al., 2018). Studies have also been carried out on open education for the democratization of knowledge (Ramírez-Montoya, 2020), where the growing number of online courses, especially Massive and Open Online Courses (MOOCs), have provoked a new interest in analyzing social learning in geographically distant classrooms with a large number of students (Hernández-García et al., 2015). Educators and research designers have integrated synchronous and asynchronous learning systems to facilitate communication and interaction and shared learning.

In the social construction of learning, interaction and collaboration are vital processes intensified for the co-construction of knowledge (Howe & Schnabel, 2012). In this sense, collaborative learning seeks common learning objectives where knowledge is socially built by the consensus of the participants in the work (Macera, 2017). Thus, learning occurs within a group or community (Villalonga Gómez & Marta-Lazo, 2015) whose members share the same objectives in terms of knowledge. A review study has indicated that learning communities facilitate the construction of knowledge, maximizing the benefits that students obtain from social learning environments due to the collective and social intelligence of their members (González Pérez, 2015). Hence, it is crucial to work in learning communities that encourage interaction and collaboration for the co-construction of knowledge.

Online learning communities provide a social framework for interactive processes, enabling a variety of pedagogical approaches based on students' needs. The concept of the learning community encompasses participatory knowledge, where effective learning requires dialogue and interaction between members active in the collective learning process (Kearney, 2015). In online learning communities, people share concerns and passions for the things they do, learning to do them better through their interactions (Long & Koehler, 2021), sustaining support in interpersonal connections, sharing ideas, engaging in reflective discourse and knowledge creation (Garrison, 2016). Learning may be the reason the community comes together or it may be a byproduct of participant interactions, where relevant information can be shared (Sekkal et al., 2019; Wenger, 2011) considered valuable sources of information. Among the benefits of an online learning community is interaction, which becomes one of the pillars of the educational process.

We searched Scopus and Web of Science (WoS) databases for related review studies to uncover similar studies. We found 11 articles where researchers were subjected to multiple evaluations of their academic production (Vasen & Vilchis, 2017). In general, these studies analyze topics such as social learning (Mansor et al., 2020); online communication and interaction (Shen, 2018); managing the social construction of knowledge in online communities (Houda et al., 2019; Liou et al., 2016); collaborative learning (Whalley & Barbour, 2020); communities of practice and research (Kozan & Caskurlu, 2018); development of pedagogical skills and practices in online learning (Acevedo, 2020); MOOCs (Sun & Chen, 2016); informal learning (Zheng et al., 2019); social networks (Luo et al., 2020); and social, cognitive, and teaching presence (Goeman et al., 2020). These studies focused on understanding learning processes from a social constructivist basis (Kaliisa et al.,

2022) as well as the analysis of new thematic domains through interaction (Moore & Miller, 2022). The analysis of social learning is emerging as a relevant trend due to the use of platforms that promote communities from interaction and collaboration in online learning environments.

To identify the challenges in online learning environment, this research used a Systemic Mapping Study (SMS) to analyze recent empirical evidence on the social construction of learning in articles published between January 2015 to November 2020. This type of study constitutes a useful tool for the contextualization of the selected topic and can complement other studies such as the systematic review of literature (García-Peñalvo, 2017). Bridging the research gap between the social construction of learning in virtual communities and doing so through systematic literature mapping has made it possible to analyze some challenges faced by online learning environments, especially when there is a vertiginous advance of technology and new societal demands for training through online learning environments.

This study first presents the design of the systematic mapping study, the definition of scope and objective, the search process and selection of articles, the inclusion and exclusion criteria, and the categorization criteria. Then, it continues with the results of the study and the respective discussion based on the research questions and the learning categories emerging from the mapping: situated, social, collaborative, problem-based, and socially constructed, as well as the virtual communities of learning, covering students, research, practice and the social construction of knowledge. It ends with the most relevant conclusions of the study regarding the challenges to the methodological trends. These have been primarily qualitative, establishing the need for more empirical research with mixed methods in the future, expanding geographically, especially in Latin America. In addition, research should focus on social learning through interactions, a sense of community and communication, and the challenges to learning communities in online environments such as social networks and MOOCs.

Systematic Mapping Study Design

The primary purpose of Systematic Mapping Studies is to provide an overview of the research area. This type of study makes it possible to identify the amount and type of research and the available results and determine the publication frequencies to see the trends in the area (Petersen et al., 2008). Therefore, the essential steps of the systematic mapping process are defining research questions, searching for and filtering relevant documents, using keywords to find abstracts, and extracting and mapping data. Each step of the process is associated with an outcome that contributes to the final systematic map.

In this study, the search process followed a systematic mapping based on the PRISMA method (Moher et al., 2009) to find primary studies of social construction of learning in virtual communities, in the existing literature (Pedreira et al., 2015) which were then analyzed and classified according to six criteria defined for social construction: collaborative learning, problem-based learning, self-regulated learning, situated learning, the social construction of learning, and social learning. In addition, five criteria were presented for communities based on earlier research (García-Peñalvo et al., 2015; González-Pérez et al., 2019; Jan et al., 2019; Overstreet, 2020; Pinto, 2016): learning community, a community of learners, a community of inquiry, a community of practice, and a community for the social construction of knowledge.

Certain studies (García-González & Ramírez-Montoya, 2019; García-Peñalvo, 2017; Kitchenham et al., 2010; Petersen et al., 2008; Velásquez-Durán & Ramírez-Montoya, 2018) were considered to help structure the methodological part of this work and thus, develop the following lines for the protocol: defining the research questions (and objectives), defining inclusion and exclusion criteria, identifying databases and search engines, defining search

terms, searching scientific databases, extracting relevant content and data (iterating the process in several stages), evaluating the quality of these results, and gathering the most outstanding results for analysis. The research protocol for this study is defined and presented in Figure 1.

Figure 1
Defined Protocol for the Methodological Mapping Process (author elaboration)
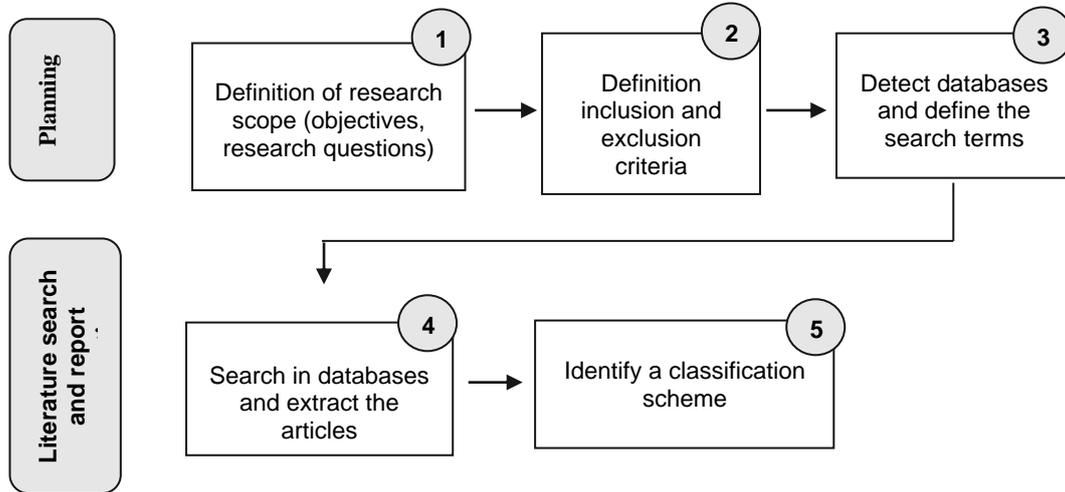
Definition of Scope and Objective (Research Questions)

Systematic Mapping Studies (SMS) aim to find and classify primary studies in a specific subject area by including research questions that are answered by searching and extracting data from the tabulation of specific categories of primary studies. In addition, they can be used to identify the available literature before undertaking a conventional Systematic Literature Review (SLR). They use the same search and data extraction methods as conventional SLRs but rely more on tabulating primary studies into specific categories (Kitchenham et al., 2010).

Therefore, this study aimed to identify and characterize the state of research about social construction of learning in virtual communities within online learning environments and identify their research advances and challenges as well as to determine potential gaps and opportunities for future research (Petersen et al., 2008). Table 1 presents the questions developed for this study.

Table 1
Research Questions

Question	Type of response sought
RQ1: What are the journals with the most publications in this line of research and their quartile?	Journals Most published articles in Q1, Q2, Q3, or Q4
RQ2: How many relevant studies are there in the Scopus and WoS databases from 2015 to 2020, and what is their design?	Number of articles in Scopus Number of articles in WoS Number of duplicated articles Number of mixed-method articles Number of qualitative research method articles

	Number of quantitative research method articles
RQ3: What are the most cited articles?	Most cited articles
RQ4: What is the geographical distribution of the authors?	Countries where the first authors are from
RQ5: What type of learning for social construction is present in the articles, and at what educational level?	Learning categories for social construction: Collaborative learning, problem-based learning, self-regulated learning, situated learning, the social construction of learning, and social learning. Primary school, high school, higher education, professionals
RQ6: What are the trends and topics covered in the articles?	Categories on emerging topics Scientific production trends in the topics

Inclusion and Exclusion Criteria

The mapping study requires explicit inclusion and exclusion criteria to evaluate each potential primary study (Kroll et al., 2018) and excludes studies that are not relevant to answer the research questions. In this research, the definition of inclusion and exclusion criteria (Table 2) applied in the databases included the period considered for mapping, type of document, language, and the relevance of the article for the social construction of learning. These criteria were applied in the title, abstract, keywords and full text when necessary. The inclusion terms selected were the following: studies addressing social construction, learning community and online learning, published from January 2015 to November 2020 in Scopus and Web of Science databases, scientific articles published only in journals, English and Spanish language. The exclusion criteria included articles that did not correspond to the selected period (2015-2020), duplicate articles, book chapters, and systematic reviews and papers that did not address social construction, learning community, and online learning.

Table 2
Inclusion and Exclusion Criteria

Inclusion criteria	Exclusion criteria
Studies on social construction, learning community, and online learning in the Scopus and WoS databases.	Studies that do not discuss social construction, learning community, and online learning.
Scientific articles and articles published in journals.	Documents from conferences, book chapters, books in press, and reports, series, books, reviews.
Articles published during 2015-2020.	Articles not published during 2015–2020.
Studies in English and Spanish	Studies in languages other than English and Spanish

Identification of Databases and Search Terms

In each database (Scopus and WoS), the query strings were created according to the search tool. A search string as similar as possible was defined and applied in the two databases so that the results could be comparable. First, keywords were selected for the search, followed by general terms used to ensure that most of the relevant research papers were included in the study.

The primary search terms were *social construction*, *learning community*, and *online learning*. Search strings can be constructed using the Boolean operators (Kitchenham, 2004); in this case, the Boolean expressions AND and OR were used. Finally, articles were selected with the specified search strings referencing the social construction of learning in virtual communities. Selection results were the basis for the mapping review questions. Searches were restricted to the title, abstracts, and keywords. The search strings used are shown in Table 3.

Table 3
Search Strings in Scopus and WoS

Search string in Scopus	Search string in WoS
(TITLE-ABS-KEY (("social construction" OR "learning community")) AND TITLE-ABS-KEY ("online learning")) AND DOCTYPE (ar) AND (LIMIT-TO (PUBYEAR , 2020) OR LIMIT-TO (PUBYEAR , 2019) OR LIMIT-TO (PUBYEAR , 2018) OR LIMIT-TO (PUBYEAR , 2017) OR LIMIT-TO (PUBYEAR , 2016) OR LIMIT-TO (PUBYEAR , 2015)) AND (LIMIT-TO (LANGUAGE , "English") OR LIMIT-TO (LANGUAGE , "Spanish"))	TS=(("social construction" OR "learning community")) AND TOPIC: ("online learning") Refined by: TYPES OF DOCUMENTS: (ARTICLE) AND LANGUAGES: (ENGLISH OR SPANISH) Time period: 2015-2020. Indices: BKCI-S, BKCI-SSH, SCI-EXPANDED, ESCI, A & HCI, SSCI, CPCI-SSH, CPCI-S.

Extraction of Articles Through Database Searches

Study selection is one of the most critical processes in a systematic mapping study. Great effort is required in the selection of articles to prevent inaccuracies in the findings. If the information provided in the title of the articles and in the abstracts was insufficient, it was necessary to read the complete document (Kroll et al., 2018). We began reading the titles and abstracts of all the studies to verify that the articles were related to social construction, learning community, and online learning. Also, keywords and concepts that reflect the contribution and the topic covered were identified (Velásquez-Durán & Ramírez-Montoya, 2018).

Regarding the data extraction and classification processes, other types of studies with meta-analyses use Cohen's Kappa Coefficient as a statistical measure to determine estimates and reliability values (Hauch et al., 2017) and adjust for the effect of chance on the proportion of observed concordance for categorical variables. However, for systematic mappings, two strategies can be followed. The first recommends an additional researcher to check results or perform the extraction independently for comparison with the initial results, requiring a consensus meeting if necessary. The second strategy states that the objectivity of the criteria is assessed based on a pilot and/or post-extraction set of articles (Petersen et al., 2015). The first strategy was followed in this research, and the second researcher verified the data extraction (Brereton et al., 2007). Thus, two researchers participated in selecting and coding the responses. In the case of discrepancies, reasoned agreements were reached and a

decision was made about selecting responses. In this sense, a protocol was formulated and executed according to the guidelines for conducting systematic literature mappings (Cruz-Benito, 2016).

Subsequently, the completed search and extraction of articles were organized in an Excel sheet. The database search yielded 199 articles in Scopus and 110 in WoS. Duplicate papers were removed (from the WoS list), resulting in 216 studies. Next, the inclusion and exclusion criteria were applied, eliminating 17 papers (11 review studies and six book chapters), leaving 199 papers. Finally, 12 articles that did not address the central themes of the study were removed, leaving 187 articles in the database, as shown in Figure 2.

Figure 2
Record Selection Procedure
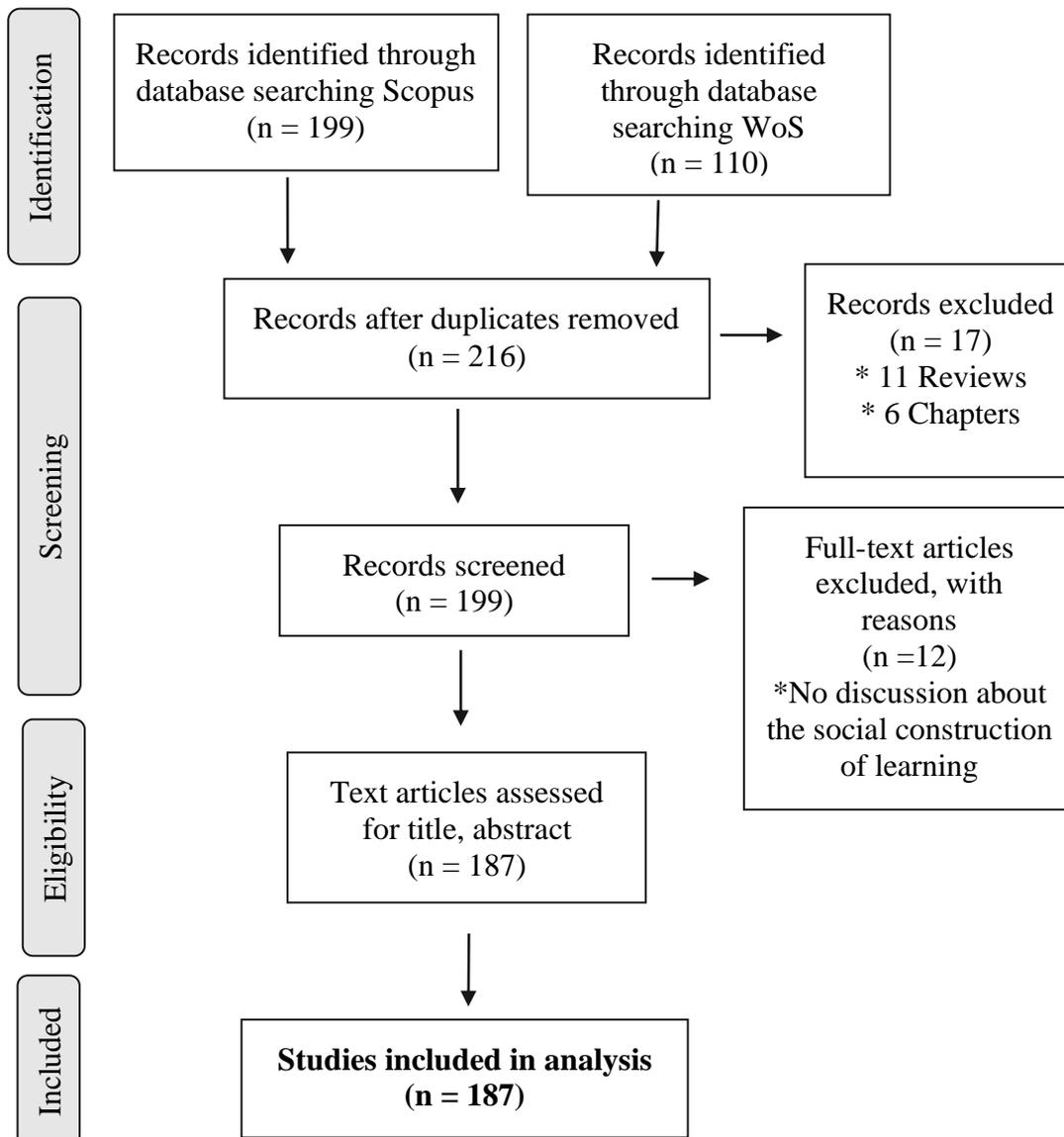
Creation of the Classification Scheme

To address the research questions, we devised a classification scheme to understand the trend of topics in the selected studies. It was a good starting point to determine the classification scheme and the distribution of articles among the identified categories (Petersen

et al., 2008). Once all the summaries were analyzed, we created the classification scheme based on keywords, concepts, and research contexts. In this research phase, six categories were used to reference social construction in virtual communities: collaborative learning, problem-based learning, self-regulated learning, situated learning, the social construction of learning, and social learning. In addition, five categories were presented for virtual communities: learning community, a community of learners, a community of inquiry, a community of practice, and a community of social construction of knowledge. Table 4 presents a brief description of these categories according to the classification scheme for this study.

Table 4

Categories to Review Studies on Virtual Communities (designed by the authors)

Categories	Description	Theoretical sustenance
Learning community	Studies that show dialogue, social interactions, and shared content for a formative purpose.	Spaces where users form digital societies to develop communication structures. Consumption patterns, specifically information and user networks, were considered broadly (García-Peñalvo et al., 2015).
Community of learners	Studies that analyze communities where students develop social interactions and share a common interest.	Communities for cognitive development through social interactions within a group of students (Overstreet, 2020).
Community of inquiry	Studies involving research communities with social and cognitive interactions and teaching presence.	Communities for learning practice and research, focusing on learning methodologies and design. It consists of three essential elements: social, cognitive, and teaching presence (Jan et al., 2019).
Community of practice	Studies that refer to communities where knowledge application is evident.	Spaces of learning and interaction, formed by a social group that builds its identity through social activity. The sense of what has been done (learning) is negotiated among the collective members, considering various levels of participation and knowledge of the activity (experts and apprentices) (González Pérez, 2015).
Community of social construction of knowledge	Studies focused on the social construction of knowledge.	Communities for knowledge transfer through active, voluntary, mutually beneficial participation to generate, acquire, implement, or facilitate access to the knowledge necessary to improve material, human, social or environmental well-being (Pinto, 2016).

Results of the Systematic Mapping Study

The methodological process of the Systematic Mapping Study (SMS) was organized systematically through a database analyzed in an Excel file containing the 187 selected articles and the corresponding information from each of these studies. The analysis made it possible to answer the research questions and present all the results in Tables and Figures.

The articles were identified with numbers and square brackets to cite them in the results. The following link is provided to access this database:
https://doi.org/10.5281/ZENODO.4673838

**RQ1: Which are the journals with the most publications in this line of research and their quartile?**

The journals with more than three published articles are shown in Table 5, with *Computers and Education* and *Online Learning Journal* being the journals with the highest scientific production on the subject. The quartiles (Q1, Q2, Q3, and Q4), the number of articles per journal, and the identification number of each article are also indicated. Corresponding to Table 5, Figure 3 shows the graphical representation of the studies having more than three publications on the social construction of learning.

Table 5

Journals with More than Three Published Articles

Journal	Quartile	Number of articles	Article identification number
Computers and Education	Q1	12	[28] [62] [77] [84] [100] [101] [103] [152] [164] [173] [184] [185]
Online Learning Journal	Q1	12	[9] [10] [12] [13] [25] [31] [96] [119] [122] [127] [129] [187]
Interactive Learning Environments	Q1	9	[16] [42] [50] [91] [121] [149] [154] [179] [182]
Distance Education	Q1	5	[47] [114] [140] [159] [178]
Internet and Higher Education	Q1	5	[53] [116] [147] [167] [171]
Journal of Chemical Education	Q1	4	[39] [61] [69] [181]
TechTrends	Q4	4	[40] [44] [86] [105]
Educational Technology and Society	Q1	4	[19] [72] [143] [176]
International Journal of Continuing Engineering Education and Life-Long Learning	Q3	3	[60] [144] [157]
International Review of Research in Open and Distance Learning	Q1	3	[29] [43] [106]
Journal of Interactive Online Learning	Q4	3	[35] [139] [166]

Figure 3
Journals with More than Three Published Articles
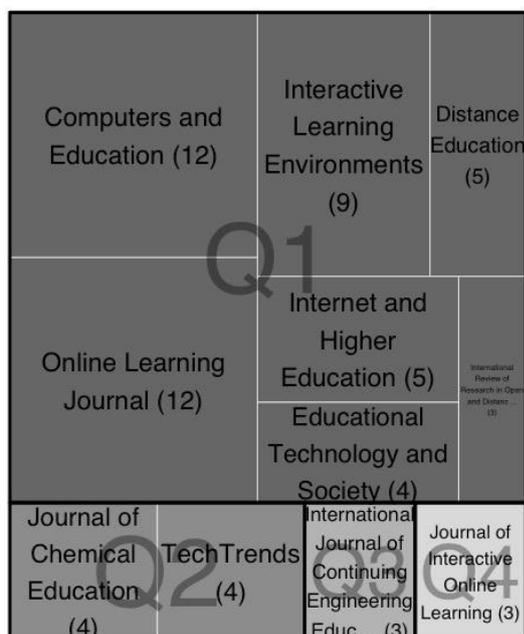
Once the journals with the highest number of publications on social construction and online learning are identified, possibilities emerge for the academic community to continue disseminating this topic, thus supporting teachers, decision-makers, designers, and researchers involved in studying the topic of learning communities.

RQ2: How many relevant studies were in the Scopus and WoS databases in the 2015 to 2020 period, and what was their design?

In the databases, a total of 187 articles were found, including 174 in Scopus and 13 in WoS. After reviewing the abstracts, the methodologies used in the studies were identified (Figure 4). Of the 174 articles identified in Scopus, 62 used a qualitative method; some examples are the articles with identification numbers [2], [3], [6]. Twenty-three employed a quantitative method, such as [27], [33], [36]. Twelve used mixed methods, such as [9], [11], [38], among others. Of the thirteen articles found in WoS, eleven used a qualitative method, e.g. [4], [7], [15], and two utilized a quantitative method [95] and [164].

Figure 4

Studies Identified in Scopus and WoS from 2015 to 2020 and Their Designs

(A) Action research - (CS) Case studies - (P) Phenomenological - (E) Ethnographies - (SE1) Sequential explanatory design - (CT) Concurrent triangulation design - (ET) Ex-post-facto: transectional designs - (EL) Ex-post-facto: longitudinal designs - (QD) Quasi-experimental designs - (N) Narratives - (GT) Grounded theory - (SE2) Sequential exploratory design
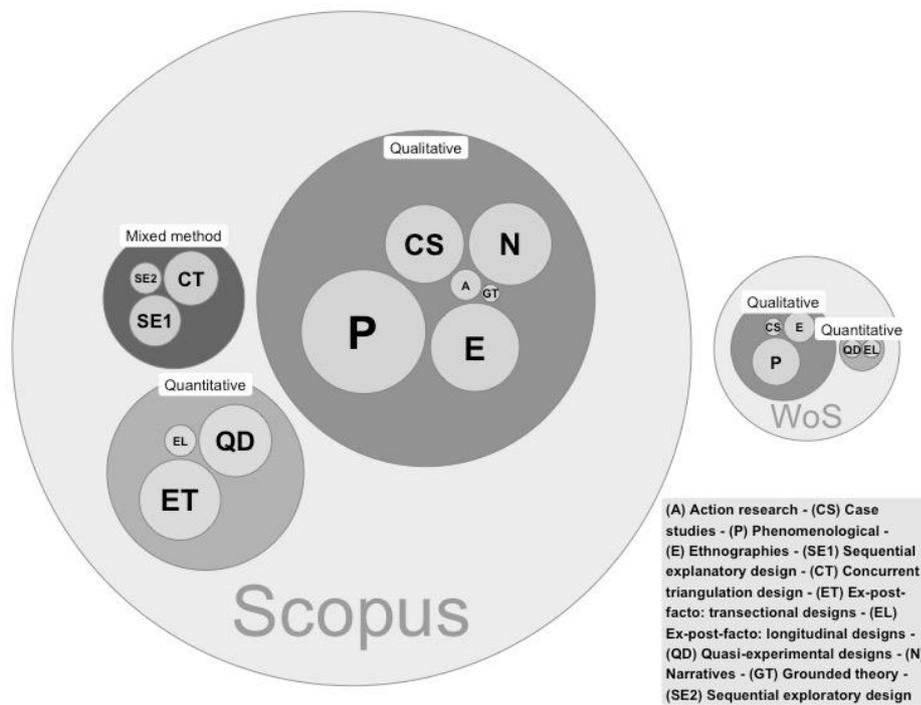
RQ3: Which were the most cited articles?

The systemic mapping study revealed that the article [73] had the highest number of citations (67), corresponding to authors Joksimović et al. (2015) in the *Journal of Computer-Assisted Learning*. This article analyzes the impact of online interactions on developing social presence and achieving learning outcomes, highlighting the quality of the social construction of knowledge. Figure 5 shows the results of the most cited articles, between 14-67 citations, ordered according to the identification number in the Excel file and the corresponding number of citations.

Figure 5

Most Cited Articles
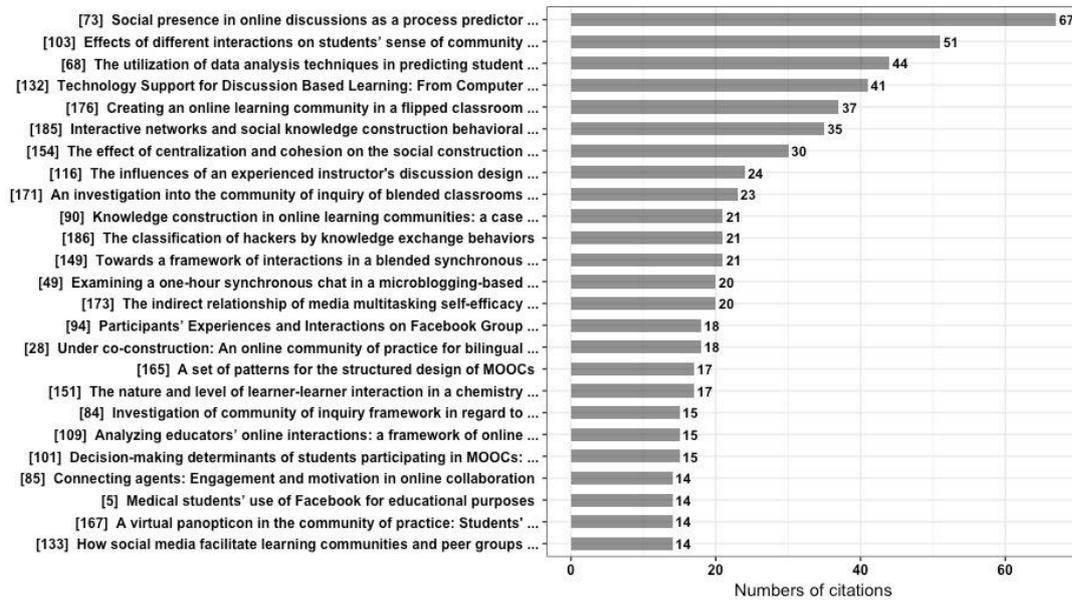
Figure 6 presents the article keywords with the highest number of citations: online learning, learning community, virtual learning community, community of practice, distance education, social networks, social presence, research community, and MOOC, among others. The keywords of the articles were extracted from the keywords of the authors.

Figure 6

Keywords of the Most Cited Articles
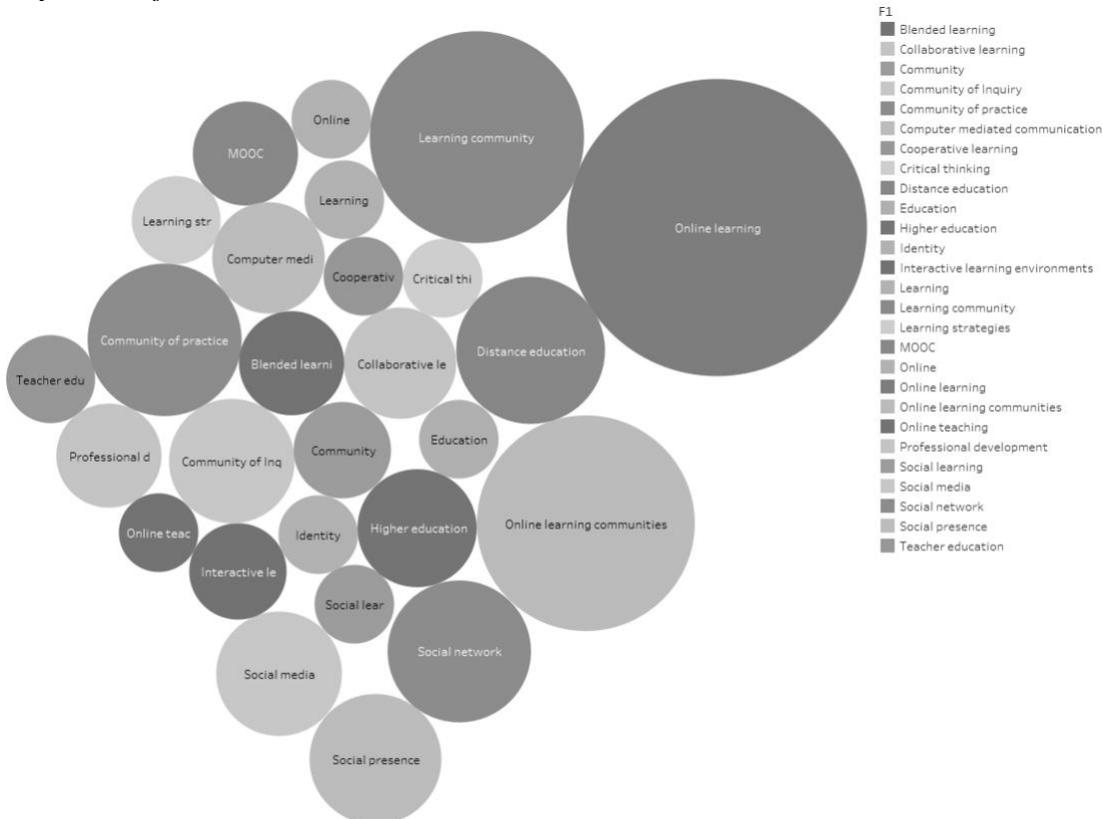
When carrying out a systematic mapping of literature on social construction of learning, it was found that the studies analyzed highlight that shared online learning is generated, mainly in virtual communities (learning, practice, research), in social networks and in MOOCs.

RQ4: What is the geographical distribution of the authors?

For the geographic distribution, the first author of the publication was considered. Thus, the most frequently published studies on social construction, learning community, and online learning (Figure 7) were the United States, with 67, Table 6 shows some examples.

Table 6

Most Frequently Published Studies in the United States

Article identification number	Citation	Title
[132]	(Rosé & Ferschke, 2016)	Technology support for discussion based learning: From computer supported collaborative learning to the future of massive open online courses
[171]	(Wicks et al., 2015)	An investigation into the community of inquiry of blended classrooms by a Faculty Learning Community
[49]	(Gao & Li, 2017)	Examining a one-hour synchronous chat in a microblogging-based professional development community
[28]	(Cho, 2016)	Under co-construction: An online community of practice for bilingual pre-service teachers
[151]	(Tawfik et al., 2017)	The nature and level of learner-learner interaction in a chemistry massive open online course (MOOC)
[109]	(Nacu et al., 2016)	Analyzing educators' online interactions: a framework of online learning support roles
[17]	(Byrd, 2016)	Understanding the online doctoral learning experience: Factors that contribute to students' sense of community
[16]	(Beth et al., 2015)	Responsibility and generativity in online learning communities
[147]	(Swaggerty & Broemmel, 2017)	Authenticity, relevance, and connectedness: Graduate students' learning preferences and experiences in an online reading education course
[152]	(Teo et al., 2017)	Analytics and patterns of knowledge creation: Experts at work in an online engineering community
[1]	(Abdelmalak, 2015)	Web 2.0 technologies and building online learning communities: Students' perspectives
[14]	(Berry, 2017a)	Student support networks in online doctoral programs: Exploring nested communities
[40]	(Delmas, 2017)	Using VoiceThread to Create Community in Online Learning
[97]	(Liu et al., 2016)	Participatory media for teacher professional development: toward a self-sustainable and democratic community of practice
[13]	(Berry, 2017b)	Building community in online doctoral classrooms: Instructor practices that support community

The United Kingdom was second with 20 publications, followed by China (19), Taiwan (12), Australia and Spain (9 each), Canada (8), New Zealand and Turkey (5 each), Malaysia (4), Saudi Arabia and South Africa (3 each), India, Italy, and South Korea and Thailand (2 each). Countries with one publication are not noted.

Figure 7
*Geographical Distribution of Authors*

Consequently, the distribution of these studies on social construction denote research opportunities, especially in countries and regions where production is low, such as Latin America.

RQ5: What type of learning for social construction is present in the articles, and at what educational level?

The results of the systematic mapping indicated that research on social construction was mainly carried out in higher education and addressed various types of learning (Figure 8). Thus, 91 studies analyzed social learning where social interaction, sense of community, communication, and informal learning were highlighted. Sixty-one articles discussed collaborative learning and primarily focused on social interactions and a sense of community. Twenty articles were linked to situated learning and mainly addressed co-design/co-creation. Ten studies were associated with self-regulated learning directed towards social interactions. Finally, five studies examined problem-based learning and highlighted social construction in learning activities.

Figure 8

Types of Learning for Social Construction Present in the Articles and the Educational Level
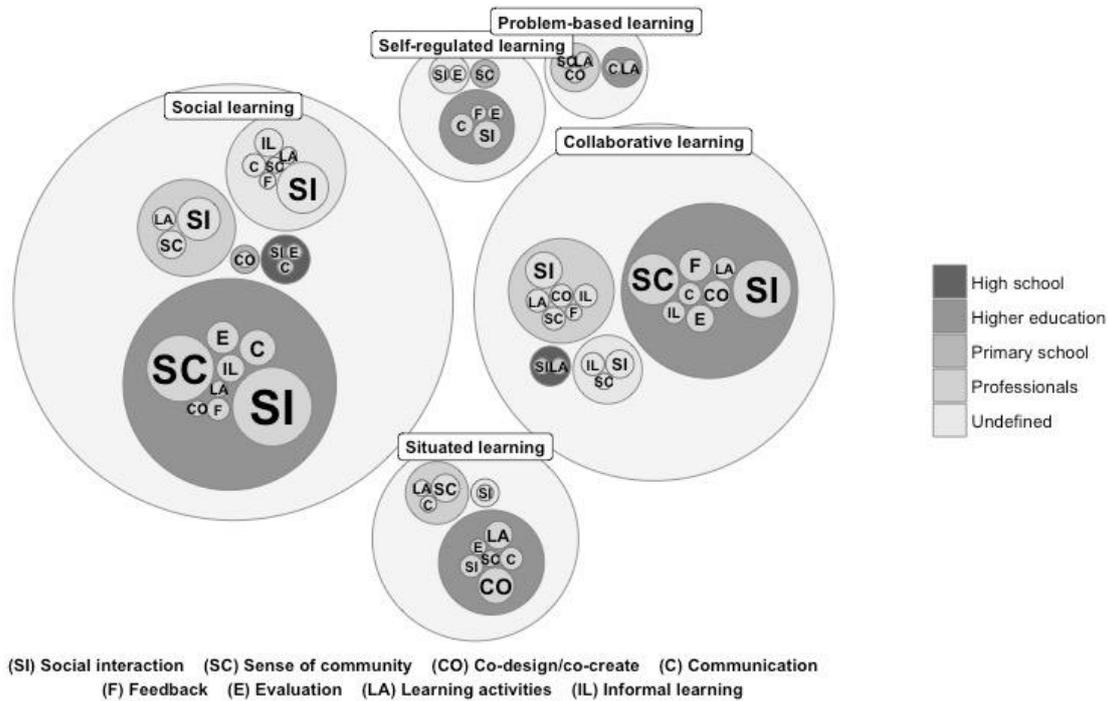
These results revealed that social learning is mainly evidenced through interactions; however, problem-based learning could be a critical area to foster the social construction of learning and, consequently, the growth of research.

RQ6: What are the trends and topics covered in the articles?

To analyze the articles' trends and themes (Figure 9), we identified five categories of a virtual community: learning, students, research, practice and social construction of knowledge. These communities developed online through virtual environments (e.g. social networks, massive open online courses) appeared in 90 studies; 74 were conducted in virtual classrooms, 14 in educational centers, and nine within the city or region (with blended learning).

As for the types of virtual community found, there were 105 studies on learning communities where the main themes were interactive platforms (forums, blended learning, audios, chat). Some articles addressed the presence of digital pedagogy (discussing training professionals in various areas involved in online learning and encouraging shared learning). In addition, 29 studies focused on communities of practice and were more oriented to applying learning and digital pedagogy. Twenty-four studies referred to research communities and 12 to communities of learners. In these two types of communities, the use of interactive platforms and interest in learning outcomes stood out. Finally, 14 studies on knowledge construction communities examined the application of learning and social constructivism.

Figure 9

Trends and Topics Covered in the Articles
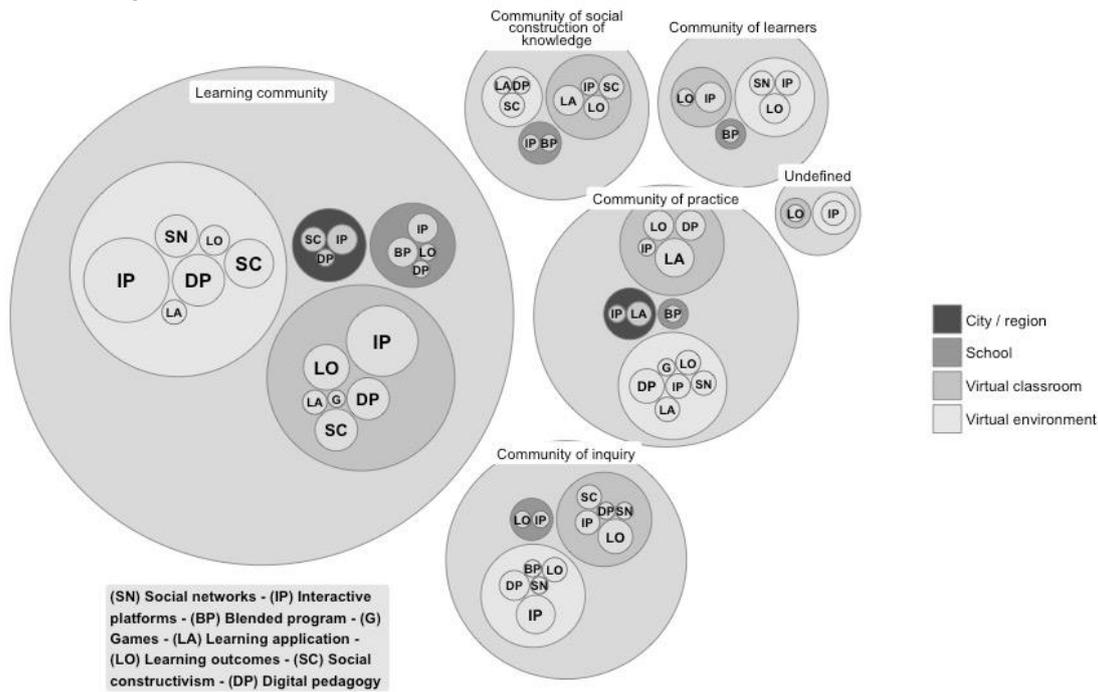
The results in Figure 9 highlight the virtual communities (classroom and environment). Most trends and topics concerned social construction, identifying learning communities and interactivity through discussion forums. These results also highlight areas of opportunity, especially in studies on knowledge construction communities and the application of learning.

Discussion

Research on the social construction of learning accounts for evidence across learning communities. Our research results were obtained based on the scientific knowledge found through articles published in academic-scientific journals constituted in one of the main channels of communication and dissemination of the results of the research. Table 5 and Figure 3 present the journals with more than three articles published on the scope of this research, the quartiles of the journals are also shown, with Q1 being the most outstanding. The scientific knowledge evidenced through the journals that have gone through a previous review of other members of the scientific community (Vasen & Vilchis, 2017) guarantees the quality of the scientific production and consequently the scientific rigor of the published articles that were the basis for the findings obtained in the present study.(Vasen & Vilchis, 2017).

Publications related to the social construction of learning in online learning environments are indexed in different databases, which show this scientific production and methodological trends in educational research. In the main academic databases, Scopus and WoS (Duart et al., 2017), educational research uses various methodological approaches, such as the qualitative approach, to understand social phenomena from the perspective and experience of participants (Ary et al., 2018). Thus, most scientific production was found in the Scopus database. Of interest is the fact that the methodological trend of greater use in the analyzed studies was the qualitative methodology with a phenomenological design (Figure 4); however, we identify fewer studies that used quantitative methods and even fewer that were conducted with mixed methods. This finding is representative because it invites the scientific community to make decisions for new studies, which may involve the mixed method, as new research questions arise about the social construction of learning.

Online learning has become an integral part of the educational landscape and an essential part of learning communities. In this research, the most cited articles (Figure 5) addressed topics (Figure 6) such as learning community, community of practice, distance education, social networks, social presence, research communities, MOOCs, computer-mediated communication, collaborative learning, higher education; these topics were discussed as promising areas for the development of online learning. Within the changes in new learning environments, community-based learning (UNESCO, 2017) distinguishes the concept of learning community as a framework with great potential to carry out interaction processes (Kearney, 2015) where its members need technological support and sustainable learning communities (Garrison, 2016) to facilitate online learning activities (Sekkal et al., 2019). Hence, it is necessary to envision new paths for training in online learning environments that support social learning from interaction in learning communities in the light of technological development and the training needs of students.The increase in scientific knowledge about the social construction of learning in virtual communities through learning environments is globally widespread. The research reflected that the United States, the United Kingdom and China have the highest number of publications on the subject, during the period considered for this research, while in Latin America, lower scientific production was detected (Figure 7). This finding reveals areas of opportunity (Ramírez-Montoya, 2020) so that researchers from other countries can contribute to the research of the social construction of knowledge (Gonzalez & Ozuna, 2021) and the analysis of interaction processes for learning (Alwafi, 2022; González-Sanmamed et al., 2019) in favor of virtual learning communities. Additionally, eLearning platforms have allowed systems and programs for online learning (Elshareif & Mohamed, 2021) to evolve beyond technology because they open possibilities to meet the needs of students as a component of the digital ecosystem (García-Peñalvo & Seoane Pardo, 2015) aimed at the management of learning and knowledge, which plays an important role in improving interaction processes.

In the realm of higher education, learning in a social context involves interaction, participation, and shared experiences, which affirm the social importance of learning. Thus, most of these investigations highlight training processes at the higher education level, where social and collaborative learning are promoted and highlighted as relevant social interaction, sense of community, communication, learning activities, informal learning and co-design/co-creation (Figure 8). This dynamic of social learning benefits when in the learning community there are processes of active collaboration, communication and community interaction (Lin & Hsia, 2019; Michailidis et al., 2018). In addition, a smaller percentage of studies highlighted learning located in the social construction of learning, from a social interaction that promotes, crucially, the participation and learning of students (Tegos & Demetriadis, 2017) by engaging in levels of activity that could not be managed individually (Yulianto et al., 2016) and that, critical moments such as the COVID-19 pandemic emphasized the urgency of preparing for online learning, cultivating relationships, and the importance of interaction (Ensmann et al., 2021b; Long & Koehler, 2021; Quintana et al., 2021). Consequently, the dynamics of learning are significantly influenced by the active social participation of the student within the learning community(Ensmann et al., 2021a) for which the importance of connections with others stands out.

Learning as a result of being part of virtual communities gives a prominent role to the active social participation of the student. In this sense, the research trends shown by the articles were framed in five categories of virtual communities (Figure 9), the most evident being learning communities, communities of practice and research communities, which contain a valuable capital of experiences, in terms of shared learning, in most cases in the form of discussions or debates (Houda et al., 2019). The relevant topics addressed in the studies were interactive platforms and shared learning through forums, blended learning,

audios and chat; therefore, peer support and continuous communication and interaction provided opportunities to create a sense of learning in community (Acevedo, 2020) and a significance of social experience (González Pérez, 2015). These formative experiences occurred (González Pérez, 2015) mainly through social networks or massive open online courses (MOOCs), where students developed their learning through the collective knowledge or intellectual capital of their members, which gradually increased the knowledge base of the community (Liou et al., 2016). In these conditions, shared social knowledge becomes very enriching within virtual communities to effectively promote the social construction of learning.

Conclusions

Research on the social construction of learning in virtual communities demonstrates several challenges for online learning environments, including the need to bring new perspectives on the subject through mixed-methods research. Another challenge is to increase scientific production, particularly in Latin America, a geographical area where less publication has been detected. On the other hand, while most studies have highlighted social interaction as a key element in the social construction of learning, it is important to continue the investigation of those interaction practices with the greatest impact to enhance social learning, collaborative learning, situated learning, problem-based learning, in online learning environments. Finally, we identify challenges in learning communities, communities of practice, research communities and communities of social construction of knowledge. These can develop social learning through forums, mixed learning, audios or chat, considering training initiatives through social networks and MOOCs that allow the social construction of knowledge and the experience of socially shared learning. The limitations of the study lie in the databases analyzed, and the time range and languages of the articles, elements that could be expanded. However, the scope of the analyses can be broadened by systematically reviewing the literature to analyse in depth the topic of interest.

The differentiating value of this study is its bibliographic contribution in the investigation of the social construction of learning in learning communities. On a practical level, this paper provides a description of the challenges facing online learning environments, which may be particularly useful in supporting teachers, decision makers, instructional designers, and researchers in their future research on this topic. We recommend that future studies advance research in this area, envisioning online learning environments that strengthen social interaction and consequently meet online learning needs in a knowledge society.

Conflict of Interests
The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

References

Abdelmalak, M. M. M. (2015). Web 2.0 Technologies and Building Online Learning Communities: Students' Perspectives. *Online Learning*, *19*(2), n2.

Acevedo, M. A. (2020). Teaching quantitative ecology online: An evidence-based prescription of best practices. *Ecology and Evolution*, *10*(22), 12457-12464. https://doi.org/10.1002/ece3.6607

Alwafi, E. (2022). Designing an Online Discussion Strategy with Learning Analytics Feedback on the Level of Cognitive Presence and Student Interaction in an Online Learning Community. *Online Learning*, *26*(1). https://doi.org/10.24059/olj.v26i1.3065

Ary, D., Jacobs, L. C., Irvine, C. K. S., & Walker, D. (2018). *Introduction to research in education*. Cengage Learning.

Berry, S. (2017a). Student Support Networks in Online Doctoral Programs: Exploring Nested Communities. *International Journal of Doctoral Studies*, *12*, 033-048. https://doi.org/10.28945/3676

Berry, S. (2017b). Building Community in Online Doctoral Classrooms: Instructor Practices that Support Community. *Online Learning*, *21*(2). https://doi.org/10.24059/olj.v21i2.875

Beth, A. D., Jordan, M. E., Schallert, D. L., Reed, J. H., & Kim, M. (2015). Responsibility and generativity in online learning communities. *Interactive Learning Environments*, *23*(4), 471-484. https://doi.org/10.1080/10494820.2013.788035

Brereton, P., Kitchenham, B. A., Budgen, D., Turner, M., & Khalil, M. (2007). Lessons from applying the systematic literature review process within the software engineering domain. *Journal of systems and software*, *80*(4), 571-583. http://dx.doi.org/10.1016/j.jss.2006.07.009

Byrd, J. C. (2016). Understanding the Online Doctoral Learning Experience: Factors That Contribute to Students' Sense of Community. *Journal of Educators Online*, *13*(2), 102-135.

Cajiao, F. (2017). Educación superior en América Latina y el Caribe: Desafíos y asuntos pendientes. *Revista Educación Superior y Sociedad (ESS)*, *24*(24), 161-180.

Cho, H. (2016). Under co-construction: An online community of practice for bilingual pre-service teachers. *Computers & Education*, *92*, 76-89. https://doi.org/10.1016/j.compedu.2015.10.008

Cruz-Benito, J. (2016). *Systematic literature review & mapping*. http://repositorio.grial.eu/handle/grial/685

Delmas, P. M. (2017). Using VoiceThread to Create Community in Online Learning. *TechTrends*, *61*(6), 595-602. https://doi.org/10.1007/s11528-017-0195-z

Dron, J., & Ostashewski, N. (2015). Seeking connectivist freedom and instructivist safety in a MOOC. *Educación XX1*, *18*(2), 51-76.

Duart, J. M., Roig-Vila, R., Universidad de Alicante, Mengual-Andrés, S., Universidad de Valencia, Maseda Durán, M.-Á., & Universidad de Valencia. (2017). La calidad pedagógica de los MOOC a partir de la revisión sistemática de las publicaciones JCR y Scopus (2013-2015). *Revista Española de Pedagogía*, *75*(1), 29-46. https://doi.org/10.22550/REP75-1-2017-02

Elshareif, E., & Mohamed, E. (2021). The effects of e-learning on students' motivation to learn in higher education. *Online Learning*, *25*(3), 128-143. https://doi.org/10.24059/olj.v25i3.2336

Ensmann, S., Whiteside, A., Gomez-Vasquez, L., & Sturgill, R. (2021a). Connections Before Curriculum: The Role of Social Presence During COVID-19 Emergency Remote Learning for Students. *Online Learning*, *25*(3). https://doi.org/10.24059/olj.v25i3.2868

Ensmann, S., Whiteside, A., Gomez-Vasquez, L., & Sturgill, R. (2021b). Connections Before Curriculum: The Role of Social Presence During COVID-19 Emergency Remote Learning for Students. *Online Learning*, *25*(3). https://doi.org/10.24059/olj.v25i3.2868

Escardíbul, J.-O., & Mediavilla, M. (2016). El efecto de las TIC en la adquisición de competencias. Un análisis por tipo de centro educativo. *Revista española de pedagogía*, 317-335.

Flood, S., Cradock-Henry, N. A., Blackett, P., & Edwards, P. (2018). Adaptive and interactive climate futures: Systematic review of 'serious games' for engagement and decision-making. *Environmental Research Letters*, *13*(6), 063005. https://doi.org/10.1088/1748-9326/aac1c6

Galoyan, T., Betts, K., Delaney, B., & Fourie, M. (2021). Exploring Online Pedagogical Practices for Enhancing Transfer of Learning in Higher Education. *Online Learning*, *25*(4). https://doi.org/10.24059/olj.v25i4.2887

Gao, F., & Li, L. (2017). Examining a one-hour synchronous chat in a microblogging-based professional development community. *British Journal of Educational Technology*, *48*(2), 332-347. https://doi.org/10.1111/bjet.12384

García-González, A., & Ramírez-Montoya, M.-S. (2019). Systematic mapping of scientific production on open innovation (2015–2018): Opportunities for sustainable training environments. *Sustainability*, *11*(6), 1781. https://doi.org/10.3390/su11061781

García-Peñalvo, Borrás-Gené, O., Therón Sánchez, R., Fidalgo Blanco, Á., & Cruz-Benito, J. (2015). *Detección de aprendizaje no formal e informal en Comunidades de Aprendizaje soportadas por Redes Sociales en el contexto de un MOOC Cooperativo*. http://repositorio.grial.eu/handle/grial/489

García-Peñalvo, F. (2017). *Mapeos sistemáticos de literatura, revisiones sistemáticas de literatura y benchmarking de programas formativos*. http://repositorio.grial.eu/handle/grial/1056

García-Peñalvo, F., & Seoane Pardo, A. M. (2015). An updated review of the concept of eLearning. Tenth anniversary. *Education in the knowledge society*, *16*(1), 119-144. http://dx.doi.org/10.14201/eks2015161119144

Garrison, D. R. (2016). *E-learning in the 21st century: A community of inquiry framework for research and practice*. Routledge. https://doi.org/10.4324/9781315667263

Goeman, K., De Grez, L., van den Muijsenberg, E., & Elen, J. (2020). Investigating the enactment of social presence in blended adult education. *Educational Research*, *62*(3), 340-356.

Gonzalez, L. S., & Ozuna, C. S. (2021). Troublesome Knowledge: Identifying Barriers To Innovate For Breakthroughs In Learning To Teach Online. *Online Learning*, *25*(3). https://doi.org/10.24059/olj.v25i3.2641

González Pérez, M. A. G. (2015). Enriquecimiento tecnológico y psicopedagógico del concepto de comunidades de práctica en la educación a distancia. *Revista de Educación a Distancia (RED)*, *47*. https://revistas.um.es/red/article/view/242421

González-Pérez, L.-I., Ramírez-Montoya, M.-S., & García-Peñalvo, F. J. (2019). *Innovación educativa en estudios sobre el desarrollo y uso de la tecnología: Un mapeo sistemático*. http://repositorio.grial.eu/handle/grial/1816

González-Sanmamed, M., Muñoz-Carril, P., & Santos-Caamaño, F. (2019). Key components of learning ecologies: A Delphi assessment. *British Journal of Educational Technology*, *50*(4), 1639-1655. https://doi.org/10.1111/bjet.12805

Haubrick, J., Levy, D., & Cruz, L. (2021). Developing Peer Review of Instruction in an Online Master Course Model. *Online Learning*, *25*(3). https://doi.org/10.24059/olj.v25i3.2428

Hauch, V., Sporer, S. L., Masip, J., & Blandón-Gitlin, I. (2017). Can credibility criteria be assessed reliably? A meta-analysis of criteria-based content analysis. *Psychological Assessment*, *29*(6), 819. http://dx.doi.org/10.1037/pas0000426.supp

Hernández-García, Á., González-González, I., Jiménez-Zarco, A. I., & Chaparro-Peláez, J. (2015). Applying social learning analytics to message boards in online distance learning: A case study. *Computers in Human Behavior*, *47*, 68-80. https://doi.org/10.1016/j.chb.2014.10.038

Houda, S., Naila, A., & Samir, B. (2019). Knowledge management and reuse in virtual learning communities. *International Journal of Emerging Technologies in Learning*, *14*(16). https://doi.org/10.3991/ijet.v14i16.10588

Howe, E. L., & Schnabel, M. A. (2012). The changing face of problem-based learning: Social networking and interprofessional collaboration. En *Problem-based learning in clinical education* (pp. 121-137). Springer. https://doi.org/10.1007/978-94-007-2515-7_8

IESALC-UNESCO. (2021). *Instituto Internacional para la Educación Superior en America Latina y el Caribe*. https://www.iesalc.unesco.org/sobre-el-iesalc/

Jan, S. K., Vlachopoulos, P., & Parsell, M. (2019). Social Network Analysis and Learning Communities in Higher Education Online Learning: A Systematic Literature Review. *Online Learning*, *23*(1).

Johnson, D. W., & Johnson, R. T. (2014). Cooperative Learning in 21st Century.[Aprendizaje cooperativo en el siglo XXI]. *Anales de Psicología/Annals of Psychology*, *30*(3), 841-851. https://doi.org/10.6018/analesps.30.3.201241

Joksimović, S., Gašević, D., Kovanović, V., Riecke, B. E., & Hatala, M. (2015). Social presence in online discussions as a process predictor of academic performance. *Journal of Computer Assisted Learning*, *31*(6), 638-654. https://doi.org/10.1111/jcal.12107

Kaliisa, R., Rienties, B., Mørch, A. I., & Kluge, A. (2022). Social learning analytics in computer-supported collaborative learning environments: A systematic review of empirical studies. *Computers and Education Open*, *3*, 100073. https://doi.org/10.1016/j.caeo.2022.100073

Kearney, N. (2015). *Comunidades de aprendizaje: Un enfoque pedagógico de futuro*. http://hdl.handle.net/20.500.12579/4330

Kitchenham, B. (2004). Procedures for performing systematic reviews. *Keele, UK, Keele University*, *33*(2004), 1-26.

Kitchenham, B., Pretorius, R., Budgen, D., Brereton, O. P., Turner, M., Niazi, M., & Linkman, S. (2010). Systematic literature reviews in software engineering–a tertiary study. *Information and software technology*, *52*(8), 792-805. https://doi.org/10.1016/j.infsof.2010.03.006

Kozan, K., & Caskurlu, S. (2018). On the Nth presence for the Community of Inquiry framework. *Computers & Education*, *122*, 104-118. https://doi.org/10.1016/j.compedu.2018.03.010

Kroll, J., Richardson, I., Prikladnicki, R., & Audy, J. L. (2018). Empirical evidence in follow the Sun software development: A systematic mapping study. *Information and Software Technology*, *93*, 30-44. https://doi.org/10.1016/j.infsof.2017.08.011

Lin, Y.-N., & Hsia, L.-H. (2019). From social interactions to strategy and skills promotion. *Journal of Educational Technology & Society*, *22*(2), 71-85.

Lind, J., Ghirlanda, S., & Enquist, M. (2019). Social learning through associative processes: A computational theory. *Royal Society open science*, *6*(3), 181777.

Liou, D.-K., Chih, W.-H., Yuan, C.-Y., & Lin, C.-Y. (2016). The study of the antecedents of knowledge sharing behavior: The empirical study of Yambol online test community. *Internet Research*. https://doi.org/10.1108/IntR-10-2014-0256

Liu, K., Miller, R., & Jahng, K. E. (2016). Participatory media for teacher professional development: Toward a self-sustainable and democratic community of practice. *Educational Review*, *68*(4), 420-443. https://doi.org/10.1080/00131911.2015.1121862

Long, Y., & Koehler, A. A. (2021). Student Participation and Interaction in Online Case-Based Discussions: Comparing Expert and Novice Facilitation. *Online Learning*, *25*(4). https://doi.org/10.24059/olj.v25i4.2901

Luo, Freeman, C., & Stefaniak, J. (2020). Like, comment, and share professional development through social media in higher education: A systematic review. *Educational Technology Research and Development*, *68*(4), 1659-1683. https://doi.org/10.1007/s11423-020-09790-5

Macera, I. M. (2017). El taller y la integración curricular. Reflexiones sobre la herencia y el porvenir en el aula universitaria. *Praxis Pedagógica*, *17*(21), 79-94. https://doi.org/10.26620/uniminuto.praxis.17.21.2017.79-94

Mansor, N. A., Abdullah, N., & Rahman, H. (2020). Towards electronic learning features in education 4.0 environment: Literature study. *Indones. J. Electr. Eng. Comput. Sci*, *19*(1), 442. https://doi.org/10.11591/ijeecs.v19.i1.pp448-456

Michailidis, N., Kapravelos, E., & Tsiatsos, T. (2018). Interaction analysis for supporting students' self-regulation during blog-based CSCL activities. *Journal of Educational Technology & Society*, *21*(1), 37-47.

Moher, D., Liberati, A., Tetzlaff, J., Altman, D. G., & Prisma Group. (2009). Preferred reporting items for systematic reviews and meta-analyses: The PRISMA statement. *PLoS medicine*, *6*(7), e1000097. https://doi.org/10.1371/journal.pmed.1000097

Moore, R. L., & Miller, C. N. (2022). Fostering Cognitive Presence in Online Courses: A Systematic Review (2008-2020). *Online Learning*, *26*(1). https://doi.org/10.24059/olj.v26i1.3071

Nacu, D. C., Martin, C. K., Pinkard, N., & Gray, T. (2016). Analyzing educators' online interactions: A framework of online learning support roles. *Learning, Media and Technology*, *41*(2), 283-305. https://doi.org/10.1080/17439884.2015.975722

Noguchi, F., Guevara, J. R., & Yorozu, R. (2018). *Comunidades en acción: Aprendizaje a lo largo de toda la vida para el desarrollo sostenible*. https://repositorio.minedu.gob.pe/

Overstreet, M. (2020). Strategies for building community among learners in online courses. *College Teaching*, *68*(1), 45-48. https://doi.org/10.1080/87567555.2019.1707756

Pedreira, O., García, F., Brisaboa, N., & Piattini, M. (2015). Gamification in software engineering–A systematic mapping. *Information and software technology*, *57*, 157-168. https://doi.org/10.1016/j.infsof.2014.08.007

Petersen, K., Feldt, R., Mujtaba, S., & Mattsson, M. (2008). *Systematic mapping studies in software engineering*. 1-10. https://www.scienceopen.com/hosted-document?doi=10.14236/ewic/EASE2008.8

Petersen, K., Vakkalanka, S., & Kuzniarz, L. (2015). Guidelines for conducting systematic mapping studies in software engineering: An update. *Information and Software Technology*, *64*, 1-18. http://dx.doi.org/10.1016/j.infsof.2015.03.007

Pinto, H. (2016). *Instituciones, innovación y transferencia de conocimiento: Contribuciones de los estudios sobre las variedades del capitalismo*. http://hdl.handle.net/11146/511

Quintana, R. M., Pinto, J. D., & Tan, Y. (2021). What We Learned When We Compared Discussion Posts from One MOOC Hosted on Two Platforms. *Online Learning*, *25*(4). https://doi.org/10.24059/olj.v25i4.2897

Ramírez-Montoya, M. S. (2020). Challenges for Open Education with Educational Innovation: A Systematic Literature Review. *Sustainability*, *12*(17), 7053. https://doi.org/10.3390/su12177053

Rosé, C. P., & Ferschke, O. (2016). Technology support for discussion based learning: From computer supported collaborative learning to the future of massive open online courses. *International Journal of Artificial Intelligence in Education*, *26*(2), 660-678. https://doi.org/10.1007/s40593-016-0107-y

Sanahuja, J. A., & Tezanos Vázquez, S. (2017). «Del milenio a la sostenibilidad»: Retos y perspectivas de la Agenda 2030 para el desarrollo sostenible. *Política y Sociedad*, *54*(2), 521-543. https://doi.org/10.5209/POSO.51926

Sekkal, H., Amrous, N., & Bennani, S. (2019). Knowledge Management and Reuse in Virtual Learning Communities. *International Journal of Emerging Technologies in Learning (IJET)*, *14*(16), 23. https://doi.org/10.3991/ijet.v14i16.10588

Shen, G. (2018). Investigation and Reflection on College English Teachers' Informationized Teaching Research Ability. *Journal of Advanced Oxidation Technologies*, *21*(2). https://doi.org/10.26802/jaots.2018.11077

Shukla, T., Dosaya, D., Nirban, V. S., & Vavilala, M. P. (2020). Factors extraction of effective teaching-learning in online and conventional classrooms. *International Journal of Information and Education Technology*, *10*(6), 422-427.

Souviron-López, M. B. (2018). Enseñar Lengua. Hacia un nuevo concepto de aprendizaje. *Estrategias didácticas para el desarrollo de la expresión oral y escrita*. https://riuma.uma.es/xmlui/handle/10630/15762

Sun, A., & Chen, X. (2016). Online education and its effective practice: A research review. *Journal of Information Technology Education*, *15*. https://doi.org/10.28945/3502

Swaggerty, E. A., & Broemmel, A. D. (2017). Authenticity, relevance, and connectedness: Graduate students' learning preferences and experiences in an online reading education course. *The Internet and Higher Education*, *32*, 80-86. https://doi.org/10.1016/j.iheduc.2016.10.002

Tawfik, A. A., Reeves, T. D., Stich, A. E., Gill, A., Hong, C., McDade, J., Pillutla, V. S., Zhou, X., & Giabbanelli, P. J. (2017). The nature and level of learner–learner interaction in a chemistry massive open online course (MOOC). *Journal of Computing in Higher Education*, *29*(3), 411-431. https://doi.org/10.1007/s12528-017-9135-3

Tegos, S., & Demetriadis, S. (2017). Conversational agents improve peer learning through building on prior knowledge. *Journal of Educational Technology & Society*, *20*(1), 99-111.

Teo, H. J., Johri, A., & Lohani, V. (2017). Analytics and patterns of knowledge creation: Experts at work in an online engineering community. *Computers & Education*, *112*, 18-36. https://doi.org/10.1016/j.compedu.2017.04.011

UNESCO. (2017). *Community-based learning for sustainable development*. https://www.local2030.org/library/321/Community-based-learning-for-sustainable-development.pdf

Vasen, F., & Vilchis, I. L. (2017). Sistemas nacionales de clasificación de revistas científicas en América Latina: Tendencias recientes e implicaciones para la evaluación académica en ciencias sociales. *Revista Mexicana de Ciencias Políticas y Sociales*, *62*(231), 199-228. https://doi.org/10.1016/S0185-1918(17)30043-0

Velásquez-Durán, A., & Ramírez-Montoya, M. S. (2018). *Research management systems: Systematic mapping of literature (2007-2017)*. http://hdl.handle.net/11285/632426

Villalonga Gómez, C., & Marta-Lazo, C. M. (2015). *Modelo de integración educomunicativa de 'apps' móviles para la enseñanza y aprendizaje*. http://dx.doi.org/10.12795/pixelbit.2015.i46.09

Wenger, E. (2011). *Communities of practice: A brief introduction*. https://wenger-trayner.com/wp-content/uploads/2015/04/07-Brief-introduction-to-communities-of-practice.pdf

Whalley, R., & Barbour, M. K. (2020). Collaboration and virtual learning in New Zealand rural primary schools: A review of the literature. *Turkish Online Journal of Distance Education*, *21*(2), 102-125. https://doi.org/10.17718/TOJDE.727983

Wicks, D. A., Craft, B. B., Mason, G. N., Gritter, K., & Bolding, K. (2015). An investigation into the community of inquiry of blended classrooms by a Faculty Learning Community. *The Internet and Higher Education*, *25*, 53-62. https://doi.org/10.1016/j.iheduc.2014.12.001

Yulianto, B., Prabowo, H., Kosala, R., & Hapsara, M. (2016). *MOOC architecture model for computer programming courses*. 35-40. https://doi.org/10.1109/ICIMTech.2016.7930298

Zheng, L., Zhang, X., & Gyasi, J. F. (2019). A literature review of features and trends of technology-supported collaborative learning in informal learning settings from 2007 to 2018. *Journal of Computers in Education*, *6*(4), 529-561. https://doi.org/10.1007/s40692-019-00148-2

The Role of Prior Online Learning Experience on Student Community of Inquiry, Engagement, and Satisfaction Scores

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Abstract
The increase in online education creates a need to explore how learning outcomes, student satisfaction, and student perceptions about online courses are affected by prior online learning experiences. This study examined the role of prior online learning experience on students' perceived cognitive presence, social presence, teaching presence, engagement, and satisfaction. The archival data of online learners at a large midwestern university (a total *n*=878), including survey responses related to Community of Inquiry (CoI), engagement, and satisfaction, were utilized to conduct statistical analyses to determine whether student responses differed by the number of online courses taken previously. We found that only social presence scores (CoI sub-scale) and emotional engagement scores (engagement sub-scale) differed by the number of the online courses taken. However, the effect size was small. We concluded that student satisfaction, engagement, and perceptions of cognitive and teaching presence are not related to prior online course experiences. Implications are discussed.

Keywords: Online learning, prior online learning, Community of Inquiry, engagement, satisfaction

The number of online courses around the globe continues to increase (Lederman, 2018). For instance, in the United States, 31.6% of students in higher education completed at least one online course between Fall 2015 to Fall 2016 (Seaman et al., 2018). Admission in online courses has grown consecutively for fourteen years, even as traditional offerings have evened out (Seaman et al., 2018). Research has been undertaken to consider the global transition to online education as a result of COVID19: Asia (Adnan & Anwar, 2020; Baticulon et al., 2021; Islam, 2021), Australia (Dodd et al., 2021), Africa (Dube, 2020), Europe (Greek & Landri, 2021), Middle East (Hussein et al., 2020), North America (Wu et al., 2020), and South America (Coolican et al., 2020). The continuation of this trend in post-pandemic education is quite likely, considering the advantages of online learning: more active and flexible learning (Rapanta et al., 2021), as an alternative for students who cannot attend face-to-face classes for personal or professional reasons (Ladson-Billings, 2021), and its suitability for emergency situations (Cahapay et al., 2020). However, the rapid increase in online courses does not always lead to students' successful completion of these courses. Students' attrition rates are still higher than traditional face-to-face courses (Ferguson, 2020; Garratt-Reed et al., 2016; Hachey et al., 2013). Several factors may contribute to this phenomenon, including organizational support and relevance (Park & Choi, 2009), number of credit hours in which students are enrolled, students' prior GPA (Aragon & Johnson, 2008), students' use of strategies (Wang et al., 2013), and students' online learning self-efficacy (Shen et al., 2013). Given this, there is a vested interest in understanding students' learning experiences in an online environment.

Students' prior online learning experience has been discussed in the literature as an important factor that impacts learning outcomes and perceptions. However, empirical evidence is mixed in support of its role. For instance, prior online learning experiences can positively affect students' expectations of online courses (Hixon et al., 2016), perceptions of online courses (Astani et al., 2010), self-efficacy (Shen et al., 2013), utilization of strategies (Shih et al., 2006; Wang et al., 2013), motivation (Yoo, 2013), engagement (Martin & Bolliger, 2018), satisfaction (Jan, 2015; Landrum, 2020), and learning outcomes from online courses (Hachey et al., 2015) to varying degrees. On the other hand, some research has demonstrated the negative effect of prior experiences for later success and perceptional changes (e.g., Arbaugh, 2005; Artino, 2011). Thus, this study aims to explore the role of prior online learning experience to further understand its relationship to student success as defined by the factors of perceived cognitive presence, social presence, teaching presence, engagement, and satisfaction.

Literature Review

Student Perceptions of Prior Online Learning Experience

Student perceptions of online courses can vary depending on the extent of their experiences with online learning. For instance, experienced students who completed at least seven courses viewed entirely different aspects of online courses as important (e.g., assessment appropriateness, content quality, available technology) than did novice students who completed three or fewer online courses (e.g., netiquette, general guidelines) (Hixon et al., 2016). This suggests that students' expectations toward online learning will change or evolve as they gain further experiences with online courses.

Additionally, some researchers found that prior online learning success is a key predictor of subsequent online course successes. For example, Hachey et al.'s study (2015) of 1,566 students enrolled in STEM courses in a large urban community college found that students who achieved higher GPAs were likely to have more prior online learning experiences. They also found that prior online learning experience significantly predicted students' successful course completion even when controlling for prior GPAs. A possible explanation for this is that as students take more online courses, they take ownership of their learning, learn to self-regulate their behavior, organize their learning, and use more deep learning strategies (Richardson & Newby, 2006).

Several lines of evidence also suggest that prior online learning experience leads to increased student satisfaction, self-efficacy, motivation, and use of strategies. For instance, Astani et al. (2010) found that prior online learning experience led to satisfactory perceptions about online learning among students in business studies. After surveying 406 students, Shen et al. (2013) found a significant positive relationship between prior online learning experience and two of the five dimensions of online learning self-efficacy: "a) self-efficacy to complete an online course, and b) self-efficacy to interact with classmates for academic purposes" (p. 16). Moreover, Wang et al. (2013) surveyed 256 undergraduate and graduate students in the U.S. and found that more experience with online learning led to the use of more effective learning strategies such as elaboration, time management, metacognitive and self-regulation, and critical thinking which, in turn, led to increased motivation in online learners. Improved organizational strategies were also found among participants who had more previous experience with information and communication technologies. For instance, participants who had more experience with internet tools organized their activities with less time and surfing fewer pages on the internet (Shih et al., 2006).

However, some contradictory findings have also been reported for prior online learning experience. For instance, Arbaugh (2005) conducted a four-year longitudinal study between 1998 and 2002 and found that students' ratings of perceived learning decreased between their beginning course and subsequent courses while they were in the Master of Business Administration (MBA) program. This means that prior online learning not only did not improve students' perceived learning over time but, in fact, caused its decline. Similarly, Artino (2011) surveyed 135 students after applying the Quality Matters Standard and concluded that students who had more prior online learning experience had lower perceptions of the quality of online course design than those who did not have any prior experience. Although the study by Yoo and Huang (2013) was inconclusive in understanding the relationship between prior online learning experience and adult students' motivation, it indicated that those learners with limited prior online experiences needed solid instructional support at least in the beginning year of their online studies.

Constructs Investigated in Relation to Prior Online Learning

Community of Inquiry Survey: Cognitive, Social and Teaching Presence. In this study, we used the Community of Inquiry (CoI) survey (Arbaugh, 2008) that was created based on the CoI framework as one of the instruments to measure student perceptions of online learning. The CoI model developed by Garrison et al. (2000) is widely used to explain the deep and meaningful online learning environment through the intersection of three interconnected components: cognitive presence, social presence, and teaching presence (Garrison et al., 2010).

Cognitive presence is defined as "the extent to which the participants in any particular configuration of a community of inquiry are able to construct meaning through sustained communication" (Garrison et al., 2000, p. 89). Social presence refers to the degree to which the learners in an online course feel socially and emotionally attached to other students (Swan et al., 2009). Anderson et al. (2001) defined teaching presence as "the design, facilitation, and direction of cognitive and social processes for the purpose of realizing personally meaningful and educationally worthwhile learning outcomes" (p. 5). Through the CoI survey, we measured student perceptions of cognitive presence, teaching presence, and social presence separately. The basis of the CoI survey is the CoI framework, which can "provide order, heuristic understanding, and a methodology for studying the potential and effectiveness of computer conferencing" (Garrison et al., 2010, p. 6).

Several research studies have investigated the interaction between different CoI presences while controlling for prior online learning experience. For instance, Archibald (2010) investigated the impact of teaching presence and social presence on cognitive presence while controlling for prior online learning experience. Shea and Bidjerano (2012) explored whether students' self-regulated learning impacted different CoI presences while controlling for prior online learning experience. Because, in both studies, prior online learning experience was controlled for, its relationship with different presences in CoI was not explored and is thus still unknown.

Student Engagement. Engagement, a key element in learning environments, refers to students' persistent efforts to achieve the set learning objectives through interaction (Hu & Kuh, 2002; Richardson & Newby, 2006). In the context of online education, engagement is considered an important variable influencing students' learning and satisfaction (Kucuk & Richardson, 2019; Mason, 2011; Robinson and Hullinger, 2008; Truhlar et al., 2018). Through a collective case study, Orcutt and Dringus (2017) found that instructors' active teaching presence beyond prescribed pedagogies (i.e., interest and passion for teaching, establishing the relevance of course content to learners, promoting a shared responsibility in the teaching and learning process) impacted student engagement and intellectual curiosity the most in a structured online learning environment. After examining four synchronous chat interactions in an introductory sustainability course, Truhlar et al. (2018) found that assignment of chat roles and students' group reflections enhanced critical student-to-student engagement, whereas students' self-reflection did not have any effect. Buelow et al. (2018) reported that students found intellectually stimulating questions pertaining to practical situations and opportunities for sharing diverse opinions and developing individual viewpoints more engaging than other strategies. After conducting a survey study examining which engagement strategies students valued most (learner-to-learner, learner-to-instructor, and learner-to-content), Martin and Bolliger (2018) found that students gave most importance to learner-to-instructor engagement strategies. They also found prior online learning experience to be a significant factor in differences of student perceptions regarding three specific interaction items: utilization of an informal virtual lounge, regular instructor email messages and announcements, and interaction with a wide range of content. For instance, an informal virtual lounge was given more importance by students with less prior experience than by students with more online experience. Through analyzing existing literature, Redmond et al. (2018) proposed an online engagement framework consisting of five engagement components: social, cognitive, emotional, collaborative, and behavioral. They also

included indicators for each type of engagement. Similarly, Reeve (2013) discussed four types of engagement: behavioral, emotional, cognitive, and agentic, and their fit within self-regulated learning theory. Behavioral engagement refers to giving attention to information sources and persevering in the learning process. Emotional engagement denotes students' inquisitiveness and mitigation of their stress level and dissatisfaction. Cognitive engagement represents students' use of effective strategies to solve problems or achieve learning objectives. Finally, agentic engagement refers to a learner-initiated drive that leads to a more effective learning environment. The final component of engagement is different from the other three as it is learner initiated and driven, whereas the other three are only learner driven. The original engagement survey developed by Reeve (2013) was intended for in-person learning environments. However, Kucuk and Richardson (2019) adapted it for online context by modifying certain words for each item without altering its meaning. For instance, "When I am in this class, I listen very carefully" was changed to "When I am in my course, I am able to focus." (Kucuk & Richardson, 2019, p. 201) In this study, we used the modified engagement survey that Kucuk and Richardson (2019) used based on the survey developed by Reeve (2013) to measure student perceptions on these four types of engagement in the online environment separately.

Student Satisfaction. Student satisfaction is also a determinant of success of online courses (Alqurashi et al., 2019; Kucuk & Richardson, 2019; Kauffman, 2015). Satisfaction of students in online courses refers to students' own perceptions of their online learning experience, and it is an important predictor of a high level of student achievement (Biner et al., 1997; Sahin & Shelley, 2008). Higher satisfaction also leads to more persistence for students in an online course (Ali & Ahmad, 2011; Joo, Joung, & Kim, 2014). A study conducted by Landrum (2020) revealed that students' satisfaction with online courses is strongly impacted by their own ability to learn online. This study also found that students' satisfaction with online courses increases as they gain more experience with online learning. Jan (2015) found a significant positive relationship between prior online learning experience and satisfaction by surveying 103 graduate students at a midwestern university. Studies have also examined the relationship between various CoI presences and student satisfaction in online courses. Through meta-analyses, for instance, Richardson et al. (2017) and Caskurlu (2020) found a moderate positive correlation between student satisfaction and social presence, and between student satisfaction and teaching presence respectively. Students' cognitive presence has also been found to be significantly related to student satisfaction (Akyol & Garrison, 2008). Therefore, we can conclude that student satisfaction is an important variable as both a predictor and determinant of success in the online learning environment. In this study, we used the instrument developed by Kuo et al. (2013) to measure student satisfaction.

Prior research has shown that the CoI framework has the potential to provide insights into the implications of various crucial outcomes of the online learning such as perceived learning, engagement, and satisfaction (Richardson et al., 2017; Kucuk & Richardson et al., 2019; Garrison & Akyol, 2013; Rockinson-Szapkiw et al., 2016; Swan, 2001). However, to date, there is no research that has explored whether prior online learning experiences play a role in students' perceived cognitive presence, social presence, teaching presence, engagement, or satisfaction. Therefore, the purpose of this study is to examine whether students' previous number of online courses had an impact on these constructs. We hypothesized that participants who had taken more online courses would have higher perceptions of these constructs than participants who had taken fewer online courses. Specifically, the research questions were:

1. To what extent do students' ratings of cognitive presence, social presence, and teaching presence in online courses differ by the number of online courses previously taken?
2. To what extent do students' ratings of their engagement in online courses differ by the number of online courses previously taken?
3. To what extent do students' ratings of their satisfaction with their online courses and instructors differ by the number of online courses previously taken?

Method

Data Sources

This study utilized the archival data collected from the students of an online MS program in Learning Design and Technology at a large Midwestern public university. The program was selected as this is where the researchers are housed and involved in the improvement of online education as researchers, designers, and instructors. The expected duration to complete this fully online program is 20 months, and the duration of each course is eight weeks. The program enrolls around 240 students at any given time. Three instruments, the Community of Inquiry survey (Arbaugh et al., 2008), an adapted version of Reeve's 2013 engagement survey (Kucuk & Richardson, 2019), and Kuo et al's satisfaction survey (2013) were administered as part of the end of course evaluation. Participation in the surveys was voluntary; however, if 90% of students from a section completed a survey, then they received two bonus points. Data were collected anonymously using the Qualtrics survey system. For this study, the data consisted of 878 responses in 100 sections of 12 courses taught by 37 instructors between fall 2016 and fall 2017.

Dependent Variables

We decided to use student perceptions rather than actual student learning (i.e., grades) as our dependent variables because our sample spanned different courses, and it may be difficult to compare grades between different courses as the grading rubrics and standards may vary greatly. Instruments of student perceptions were assumed to give us a unified measure to compare different student outcomes across courses and contexts. This argument has been supported by previous literature (Arbaugh, 2005; Richardson et al., 2010).

We used eight subscale scores from three instruments as dependent variables. The CoI survey, developed by Arbaugh (2008), is a 34-item survey on a five-point Likert scale to measure teaching presence, cognitive presence, and social presence. The reliability of this instrument has been established through Cronbach's alpha, which indicated high internal consistency: (a) cognitive presence (CP) (12 items) = 0.95, (b) social presence (SP) (nine items) = 0.91, and (c) teaching presence (TP) (13 items) = 0.94 (Arbaugh, 2008). Reliability estimates computed with our data ($n = 878$) are also comparable with what reported by Arbaugh (2008); (a) cognitive presence (CP) = 0.956, (b) social presence (SP) = 0.927, and (c) teaching presence (TP) = 0.964.

Reeve's engagement survey (2013) was adapted for the online context by Kucuk and Richardson (2019) and used to measure engagement in online courses (Note: 2019 publication utilized same data set as this study). The survey consists of 17 items on a five-point Likert scale, and the reported Cronbach's alpha with their original sample was high: (a) agentic engagement (AE) (five items) = 0.84; (b) behavioral engagement (BE) (four items) = 0.87; (c) emotional

engagement (EE) (four items) = 0.91; and (d) cognitive engagement (CE) (four items) = 0.72 (Reeve, 2013). With the current data, reliability estimates are for AE = .888, for BE =.868, for EE = .926, and for CE =.857, respectively.

The satisfaction instrument developed by Kuo et al. (2013) was utilized to measure student satisfaction (SS) with online learning. The instrument consists of five items on a five-point Likert scale. Kuo et al. (2013) reported the Cronbach's alpha of 0.93, which is similar strength of what we found with the current data (alpha = .916). We computed the average score across item responses for each component of CoI, engagement, and satisfaction scale to obtain single scale score for each construct and used for analysis (Kucuk & Richardson, 2019). Table 1 summarized intercorrelations among the eight dependent variables.

Table 1
Pearson's Correlation Matrix among Eight Dependent Variables

	DV	TP	SP	CP	BE	AE	CE	EE
Presence	TP							
	SP	.486[**]						
	CP	.719[**]	.713[**]					
Engagement	BE	.452[**]	.586[**]	.618[**]				
	AE	.505[**]	.602[**]	.633[**]	.637[**]			
	CE	.418[**]	.526[**]	.618[**]	.622[**]	.636[**]		
	EE	.712[**]	.599[**]	.846[**]	.609[**]	.584[**]	.604[**]	
Satisfaction	SA	.790[**]	.658[**]	.861[**]	.597[**]	.570[**]	.542[**]	.852[**]

**p<.01

Listwise deletion was used (*n* = 679)

Independent Variable

The original survey included a question regarding the number of online courses the student took before enrolling in the existing course. The number of previous online courses in this sample ranged from 1 to 4 courses. It is noteworthy that while our independent variable is ordinal, we decided to include the variable as a categorical variable in our inferential analyses due to the limited range and unbalanced frequencies among categories and we do not expect a monotonical relationship between the number of courses and outcome variables.

Data Analysis

Because the subscale scores of CoI (CP, TP, and SP) and engagement scores (BE, AE, CE, EE) are highly correlated (See Table 1. Presence scores ranged from *r* = .486 to .719; Engagement scores ranged from r =.584 to .637), multivariate analysis of variance (MANOVA) was conducted on the CoI and engagement scores separately to address the first two research questions. To address the third research question, we conducted a one-way analysis of variance (ANOVA) on the satisfaction outcome. We used the alpha of 0.05 to make a statistical decision on significance. Prior to the inferential analyses, we conducted a series of descriptive analyses to examine if the data met the underlying data assumptions for ANOVA and MANOVA.

Results

Descriptive Statistics

The number of previous online courses ranged from one to four with four courses taken by the highest number of respondents (67%), followed by three courses (22.2%), one course (5.6%), and two courses (5.2%). The descriptive statistics for the dependent variables (CoI scores, engagement scores, and satisfaction scores) are presented in Table 2.

Table 2

Descriptive Statistics for the Dependent Variables in Total and by the Number of Online Courses

Previously Taken

Outcome			Number of online courses								
			1		2		3		4		
		n	*M (SD)*	*n*	*M (SD)*	*n*	*M (SD)*	*N*	*M (SD)*	*p*
CoI	CP	45	4.26 (.43)	44	4.32 (.75)	182	4.17 (.64)	546	4.22 (.70)	<.001
	SP	49	4.07 (.58)	45	4.02 (.82)	185	4.10 (.64)	556	4.29 (.62)	
	TP	47	4.42 (.64)	42	4.36 (.85)	184	4.14 (.88)	553	4.29 (.78)	
Engagement	BE	48	4.47 (.44)	45	4.48 (.57)	190	4.37 (.62)	571	4.45 (.61)	.031
	AE	49	4.16 (.64)	44	4.05 (.81)	191	4.00 (.75)	568	4.14 (.69)	
	CE	47	4.47 (.49)	45	4.59 (.50)	191	4.43 (.53)	568	4.49 (.52)	
	EE	49	4.23 (.51)	46	4.29 (.72)	192	3.92 (.89)	573	4.02 (.88)	
Satisfaction	SS	49	4.40 (.56)	44	4.26 (.85)	192	4.17 (.82)	562	4.28 (.81)	.253

Note. P-values indicate the statistical significance of MANOVA /ANOVA analysis for the effect of the prior online experiences on outcomes

Inferential Analysis

The results of MANOVA for CoI scores indicate that a statistically significant difference on the CoI sub scores was observed among the groups with the different number of online courses previously taken, $F(9, 1801.12) = 5.452$, $p < .001$, Wilks' $\Lambda = .935$, partial $\eta^2 = .022$. However, the effect is small and the post-hoc analysis indicates that only Social Presence (SP) scores showed a statistically significant difference by the number of the online courses taken, $F(3, 746) = 7.532$, $p < .001$, partial $\eta^2 = .03$. More specifically, students who had taken four online courses tended to have higher SP scores compared with the rest of students. No difference in Cognitive Presence (CP) nor Teaching Presence (TP) scores was found due to the previous online course taking experiences.

The MANOVA was repeated with the set of engagement scores as outcomes. We found a significant difference in the combined engagement scores by the number of the previously taken online courses, $F(12, 2403) = 1.89$, $p = .031$, Wilks' $\Lambda = .028$, partial $\eta^2 = .009$, but the effect was small. The post hoc analyses identified only Emotional Engagement (EE) as having a statistically significant difference by the number of online courses taken previously, $F(3, 806) = 3.457$, $p = .016$, partial $\eta^2 = .013$. No difference in Agentic Engagement (EE), Behavioral Engagement (BE), and Cognitive Engagement (CE) was found for previous online course experiences. Finally, we found no statistically significant difference in satisfaction scores by the number of the online courses taken based on the results of the ANOVA, $F(3, 846) = 1.361$, $p = .253$. Thus, student satisfaction was unrelated to the number of online courses students had taken previously.

In summary, while we found some significant differences in Social Presence and Emotional Engagement based on the number of the online courses taken previously, the difference represented as an effect size tended to be small. The statistically significant effects observed might be largely due to strong statistical power to detect the differences.

Discussion and Scholarly Significance

This study examined whether students' perceived cognitive presence, social presence, teaching presence, engagement, and satisfaction differed by the number of previous online courses taken. We examined engagement and satisfaction together with CoI as engagement and satisfaction are also considered crucial elements in an online learning environment. Moreover, the relationship among the CoI presences, and engagement and satisfaction has been established in the literature (Kucuk & Richardson, 2019). Examining all these elements together helps us as designers and instructors to better understand the role of prior learning experience in an online learning environment. The results indicated that only perceived social presence (SP) and emotional engagement (EE) changed significantly as students took more online courses, though the increase was small. Social presence has also been found to be an important predictor of perceived learning and satisfaction (Richardson & Swan, 2003), and thus it is necessary to understand to what extent social presence improves by the number of prior online courses. Furthermore, the connection between social presence and emotional expressions has been previously discussed in the literature, specifically, how social presence is "associated with an emotional sense of belonging" (Garrison et al., 2010, p. 7). Moreover, "emotional expression" is one of the categories for the social presence construct of the community of inquiry (CoI) framework (Garrison et al., 2000). Perhaps the significant increase in perceived social presence and emotional engagement scores as students took more courses is a result of students gradually becoming more familiar with the online environment as they continued taking online courses, becoming more comfortable interacting with peers and instructors virtually as Richardson and Newby (2006) discussed. Akyol and Garrison (2008) found that two of the three categories of social presence (i.e., affective expression and group cohesion) changed significantly over the course of a nine-week course. Although the study was conducted within a single course, this indicated a gradual progression of social presence over time. This gradual shift in the role and capabilities of students in an online environment has been discussed in the literature; Richardson and Newby (2006) found that students progressively take on more responsibilities as they become more experienced. We believe that this finding has important implications for course designers and facilitators who should keep prior experience in mind when designing and

facilitating online courses, both for novices and more experienced students (Richardson & Newby, 2006).

We did not find significance for the other elements of CoI (CP and TP), engagement (BE, AE, CE), or satisfaction. The findings suggest that these elements are influenced by variables other than the number of previous online courses. First, cognitive presence is operationalized through the Practical Inquiry (PI) model, and has four phases: triggering event, exploration, integration, and resolution (Garrison et al., 2000). According to Garrison et al. (2001), students may not go beyond the exploration phase of the model if the design and facilitation of a course do not support it. This suggests that the extent of cognitive presence depends on the design and implementation of individual courses (Garrison et al., 2001), which refers to teaching presence, and each course is different in its design and implementation. Garrison et al. (2001) also emphasized the role of social presence and teaching presence in generating effective cognitive presence. After controlling for self-directed learning readiness, students' previous learning experience, and students' previous collaborative learning exposure, Archibald (2010) found both teaching presence and social presence significantly predicting cognitive presence in a study conducted in multiple research method courses. Therefore, having more prior online learning experience may not have helped students achieve more cognitive presence if there was not sufficient social presence and teaching presence. This also holds true for students' perceptions of teaching presence, which has been divided into three components: design and organization, facilitating discourse, and direct instruction (Anderson et al., 2001). These three components of teaching presence clearly vary depending on the instructor or instructional designer and cognitive presence. Drawing on examples from many research studies, Fiock (2020) listed numerous instructional strategies through which teaching presence, along with the other two presences, can be facilitated, and this indicates the variability of the nature of teaching presences depending on courses, instructors, and contexts. Fiock et al. (2021) also found that teaching presence scores significantly differed for different instructors even though they taught the same course with identical design. They investigated 11 sections of two courses in an online MS program. Their findings also reveal that teaching presence varies from instructor to instructor. For our present study, students' ratings of the perceived teaching presence did not differ significantly by the number of previously taken online courses, probably because there were 12 courses and 37 instructors involved with the study. Each course had its own course objectives, and instructors had varied facilitation skills. Therefore, our findings suggest that students' perceptions of teaching presence are unrelated to the number of online courses students have previously taken. As students may have taken different types of courses at different points in the program, perceptions of teaching presence also varied for each course and did not lead to stable improvement with the increase of experience with online learning.

Next, we did not observe any significant increase in students' perceived engagement with the increase of online learning except the emotional engagement sub-category. Mason (2011) found that lack of adequate facilitation is one of the reasons for poor student engagement, which indicates that teaching presence plays a major role in sustaining student engagement. This view of the impact of teaching presence on student engagement has also been supported by other literature (Martin & Bolliger, 2018; Orcutt & Dringus; 2017). Therefore, no matter how many courses students have taken previously, engagement is dependent on factors specific to a particular course. Emotional engagement may be an exception because of its connection to social presence. Finally, we also did not find any significant increase in students' satisfaction scores

with the increase of prior online learning. This is not surprising, based on what we have explained above. Teaching presence was found to be one of the major determinants of satisfaction (Kucuk & Richardson, 2019; Landrum et al., 2021; Parahoo et al., 2015), and a moderate positive correlation has also been observed between teaching presence and student satisfaction through a meta-analysis (Caskurlu, 2020). This indicates that student satisfaction highly depends on teaching presence, and similar to the previous instances, teaching presence varies from one course to another and in turn satisfaction varies from one course to another. Therefore, satisfaction is also unrelated to the number of courses students previously took.

Limitations and Future Research

There are several limitations to this study. First, the data were collected from a single graduate-level program which may limit generalizability. Future research should incorporate students from different programs and levels into the sample. Second, because the data were collected anonymously for each semester across years, the same student may have provided multiple responses to the survey, but not for the same course or in the same semester. We treated these data as independent because we asked student's affective outcomes for a specific course that a student engaged in the specific semester under a specific instructor. However, students' general attitude toward online courses may potentially influence their perceptions of online courses and satisfaction.

The highest number of prior online courses for this study was four, and this might be a reason for the small difference in perceived presences between the lowest number of courses and the highest number of courses. As students with more prior online learning experience valued completely different aspects of online learning as important compared to students with less prior online learning experience (Hixon et al., 2016), incorporating a greater range of previous online courses may provide us a clearer picture about the relationship between the prior online learning experience and different student outcomes. Thus, future research may focus on incorporating a greater range of courses previously taken to examine to what extent the perceived scores vary.

Conclusion and Implications

In conclusion, the study found that previous online learning experience had limited impact on students' perceptions of CoI presences, engagement, and satisfaction. Only social presence and emotional engagement were impacted by prior online learning experience. Nonetheless, the study has implications for course designers and instructors since understanding the online learning experience as dynamic is vital to the development of relevant instructional strategies in different stages. First, students' self-reported social presence and emotional engagement scores differed significantly by the number of previously taken online courses, indicating a progressive improvement in their perception of social presence and emotional engagement. Although we have only found small effects, the range of the prior online courses taken by students was also limited (one to four). Therefore, it may suggest a gradual growth that occurs as students take more courses and become more familiar with the environment and their responsibilities. Considering this, instructors may consider creating activities for students who have more online learning experience that requires more interaction or social presence from students. For students new to online learning, instructors should focus more on gradually creating opportunities for students to interact with each other so that interactions become more familiar and natural for them over time.

Next, more online learning experience as investigated here does not lead to stronger perceptions of teaching presence, cognitive presence, engagement, or satisfaction. Therefore, while naturally expecting a better social presence in students who take more online courses, instructors may focus on strengthening the design, facilitation, and direct instruction phase of each course so that students' perceptions of cognitive presence and teaching presence could be improved. We think the design, facilitation, and direct instruction are crucial elements for generating improved teaching and cognitive presence as these three elements are parts of teaching presence (Anderson et al., 2001), and they are also important components to improved cognitive presence (Garrison et al., 2001).

With nearly every facet of life including education impacted by the pandemic and gradually moving into the new normal, online education will continue to play a pivotal role (Cahapay et al., 2020; Ladson-Billings, 2021; Rapanta et al., 2021). Therefore, it is of crucial importance to investigate the factors that impact student outcomes in online environments. Students' prior online learning experience is one such factor that needs further investigation.

Conflict of Interest
The authors declared no conflicts of interest.

Ethical Approval
This research received ethics approval from the Institutional Review Board (IRB)of Purdue University.

References

Adnan, M., & Anwar, K. (2020). Online learning amid the COVID-19 pandemic: Students' perspectives. *Journal of Pedagogical Sociology and Psychology*, *2*(1), 45-51. https://eric.ed.gov/?id=ED606496

Akyol, Z., & Garrison, D. R. (2008). The development of a community of inquiry over time in an online course: Understanding the progression and integration of social, cognitive and teaching presence. *Journal of Asynchronous Learning Networks*, *12*, 3-22. https://doi.org/10.24059/olj.v12i3-4.1680

Ali, A., & Ahmad, I. (2011). Key factors for determining students' satisfaction in distance learning courses: A study of Allama Iqbal Open University. *Contemporary Educational Technology*, *2*(2), 118-134. https://doi.org/10.30935/cedtech/6047

Alqurashi, E. (2019). Predicting student satisfaction and perceived learning within online learning environments. *Distance Education*, *40*(1), 133-148. https://doi.org/10.1080/01587919.2018.1553562

Anderson, T., Liam, R., Randy, G. D., & Waiter, A. (2001). Assessing teaching presence in a computer conference context. *Journal of Asynchronous Learning Networks*, *5*(2), 1-17. https://doi.org/10.24059/olj.v5i2.1875

Aragon, S., & Johnson, E. (2008). Factors influencing completion and non-completion of community college online courses. *American Journal of Distance Education, 22*(3), 146-158. https://doi.org/10.1080/08923640802239962

Arbaugh, J. B. (2005). Is there an optimal design for on-line MBA courses? *Academy of Management Learning & Education*, *4*(2), 135-149. https://doi.org/10.5465/amle.2005.17268561

Arbaugh, J. B., Cleveland-Innes, M., Diaz, S. R., Garrison, D. R., Ice, P., Richardson, J. C., & Swan, K. P. (2008). Developing a community of inquiry instrument: Testing a measure of the community of inquiry framework using a multi-institutional sample. *The Internet and Higher Education*, *11*(3-4), 133-136. https://doi.org/10.1016/j.iheduc.2008.06.003

Archibald, D. (2010). Fostering the development of cognitive presence: Initial findings using the community of inquiry survey instrument. *The Internet and Higher Education*, *13*(1-2), 73-74. https://doi.org/10.1016/j.iheduc.2009.10.001

Artino, K. A. (2011). *Undergraduate students perceptions of a quality online course: online experience versus no online experience* [Master's thesis, The University of Akron]. http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.938.7609&rep=rep1&type=pdf

Astani, M., Ready, K. J., & Duplaga, E. A. (2010). Online course experience matters: Investigating students' perceptions of online learning. *Issues in Information Systems*, *11*(2), 14-21. https://doi.org/10.48009/2_iis_2010_14-21

Baticulon, R. E., Sy, J. J., Alberto, N. R. I., Baron, M. B. C., Mabulay, R. E. C., Rizada, L. G. T., Tiu, C. J. S., Clarion, C. A., & Reyes, J. C. B. (2021). Barriers to online learning in the time of COVID-19: A national survey of medical students in the Philippines. *Medical Science Educator*, *31*, 615-626. https://doi.org/10.1007/s40670-021-01231-z

Biner, P. M., Welsh, K. D., Barone, N. M., Summers, M., & Dean, R. S. (1997). The impact of remote-site group size on student satisfaction and relative performance in interactive telecourses. *American Journal of Distance Education*, *11*(1), 23-33. https://doi.org/10.1080/08923649709526949

Buelow, J. R., Barry, T., & Rich, L. E. (2018). Supporting learning engagement with online students. *Online Learning*, *22*(4), 313-340. https://doi.org/10.24059/olj.v22i4.1384

Cahapay, M. B. (2020). Rethinking education in the new normal post-COVID-19 era: A curriculum studies perspective. *Aquademia*, *4*(2), ep20018. https://doi.org/10.29333/aquademia/8315

Caskurlu, S., Maeda, Y., Richardson, J. C., & Lv, J. (2020). A meta-analysis addressing the relationship between teaching presence and students' satisfaction and learning. *Computers & Education*, *157*, 1-16. https://doi.org/10.1016/j.compedu.2020.103966

Coolican, M., Borras, J. C., & Strong, M. (2020). Argentina and the COVID-19: Lessons learned from education and technical colleges in Buenos Aires Province. *Journal of Education for Teaching*, *46*(4), 484-496. https://doi.org/10.1080/02607476.2020.1802204

Dodd, R. H., Dadaczynski, K., Okan, O., McCaffery, K. J., & Pickles, K. (2021). Psychological wellbeing and academic experience of university students in Australia during COVID-19. *International Journal of Environmental Research and Public Health*, *18*(3), 866. https://doi.org/10.3390/ijerph18030866

Dube, B. (2020). Rural online learning in the context of COVID 19 in South Africa: Evoking an inclusive education approach. *Multidisciplinary Journal of Educational Research*, *10*(2), 135-157. https://doi.org/10.17583/remie.2020.5607

Ferguson, S. (2020). Attrition in online and face-to-face calculus and precalculus courses: A comparative analysis. *Journal of Educators Online*, *17*(1). https://eric.ed.gov/?id=EJ1241557

Fiock, H. (2020). Designing a community of inquiry in online courses. *The International Review of Research in Open and Distributed Learning*, *21*(1), 135-153. https://doi.org/10.19173/irrodl.v20i5.3985

Fiock, H., Maeda, Y., & Richardson, J. C. (2021). Instructor impact on differences in teaching presence scores in online courses. *International Review of Research in Open and Distributed Learning*, *22*(3), 55-76. https://doi.org/10.19173/irrodl.v22i3.5456

Garratt-Reed, D., Roberts, L. D., & Heritage, B. (2016). Grades, student satisfaction and retention in online and face-to-face introductory psychology units: A test of equivalency theory. *Frontiers in Psychology*, *7*, 1-10. https://doi.org/10.3389/fpsyg.2016.00673

Garrison, D. R., & Akyol, Z. (2013). The community of inquiry theoretical framework. In M. G. Moore (Eds.), *Handbook of distance education* (pp. 122-138). Routledge. https://doi.org/10.4324/9780203803738.ch7

Garrison, D. R., Anderson, T., & Archer, W. (2010). The first decade of the community of inquiry framework: A retrospective. The *Internet and Higher Education*, *13*(1-2), 5-9. https://doi.org/10.1016/j.iheduc.2009.10.003

Garrison, D. R., Anderson, T., & Archer, W. (2001). Critical thinking, cognitive presence, and computer conferencing in distance education. *American Journal of Distance Education*, *15*(1), 7-23. https://doi.org/10.1080/08923640109527071

Garrison, D. R., Anderson, T., & Archer, W. (2000). Critical inquiry in a text-based environment: Computer conferencing in higher education. The *Internet and Higher Education, 2*(2-3), 87-105. https://doi.org/10.1016/s1096-7516(00)00016-6

Grek, S., & Landri, P. (2021). Editorial: Education in Europe and the Covid-19 pandemic. *European Educational Research Journal, 20*(4), 393–402. https://doi.org/10.1177/14749041211024781

Hachey, A. C., Wladis, C., & Conway, K. (2015). Prior online course experience and G.P.A. as predictors of subsequent online STEM course outcomes. *The Internet and Higher Education*, *25*, 11-17. https://doi.org/10.1016/j.iheduc.2014.10.003

Hachey, A. C., Conway, K., & Wladis, C. (2013). Community colleges and underappreciated assets: Using institutional data to promote success in online learning. *Online Journal of Distance Learning Administration*, *16*(1). https://eric.ed.gov/?id=EJ1004010

Hart, C. (2021). COVID-19 and community college instructional responses. *Online Learning*, *25*(1), 41-69. https://doi.org/10.24059/olj.v25i1.2568

Hixon, E., Ralston-Berg, P., Buckenmeyer, J., & Barczyk, C. (2016). The impact of previous online course experience on students' perceptions of quality. *Online Learning*, *20*(1), 1-16. https://doi.org/10.24059/olj.v20i1.565

Hu, S., & Kuh, G. D. (2002). Being (dis)engaged in educationally purposeful activities: The influences of student and institutional characteristics. *Research in Higher Education*, *43*(5), 555-575. https://link.springer.com/article/10.1023/A:1020114231387

Islam, S. (2021). Unlearning, relearning, and paradigm shift to online tertiary education during the COVID-19 pandemic in Bangladesh. *Bangladesh Journal of Medical Science*, *20*, 65-71. https://doi.org/10.3329/bjms.v20i5.55399

Jan, S. K. (2015). The relationships between academic self-efficacy, computer self-efficacy, prior experience, and satisfaction with online learning. *American Journal of Distance Education*, *29*(1), 30-40. https://doi.org/10.1080/08923647.2015.994366

Joo, Y. J., Joung, S., & Kim, J. (2014). Structural relationships among self-regulated learning, learning flow, satisfaction, and learning persistence in cyber universities. *Interactive Learning Environments*, *22*(6), 752-770. https://doi.org/10.1080/10494820.2012.745421

Kauffman, H. (2015). A review of predictive factors of student success in and satisfaction with online learning. *Research in Learning Technology*, *23*. https://doi.org/10.3402/rlt.v23.26507

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

Kuo, Y. C., Walker, A. E., Belland, B. R., & Schroder, K. E. (2013). A predictive study of student satisfaction in online education programs. *International Review of Research in Open and Distributed Learning*, *14*(1), 16-39. https://doi.org/10.19173/irrodl.v14i1.1338

Ladson-Billings, G. (2021). I'm here for the hard re-set: Post pandemic pedagogy to preserve our culture. *Equity & Excellence in Education*, *54*(1), 68-78. https://doi.org/10.1080/10665684.2020.1863883

Landrum, B. (2020). Examining students' confidence to learn online, self-regulation skills and perceptions of satisfaction and usefulness of online classes. *Online Learning*, *24*(3), 128-146. https://doi.org/10.24059/olj.v24i3.2066

Landrum, B., Bannister, J., Garza, G., & Rhame, S. (2021). A class of one: Students' satisfaction with online learning. *Journal of Education for Business*, *96*(2), 82-88. https://doi.org/10.1080/08832323.2020.1757592

Lederman, D. (2018, Nov 7). *Online education ascends*. Inside Higher Ed. https://www.insidehighered.com/digital-learning/article/2018/11/07/new-data-onlineenrollments-grow-and-share-overall-enrollment

Martin, F., & Bolliger, D. U. (2018). Engagement matters: Student perceptions on the importance of engagement strategies in the online learning environment. *Online Learning*, *22*(1), 205-222. doi:10.24059/olj. v22i1.1092

Mason, R. B. (2011). Student engagement with, and participation in, an e-forum. *Journal of Educational Technology & Society*, 14(2), 258-268. https://www.jstor.org/stable/pdf/jeductechsoci.14.2.258.pdf

Orcutt, J. M., & Dringus, L. P. (2017). Beyond being there: Practices that establish presence, engage students and influence intellectual curiosity in a structured online learning environment. *Online Learning*, *21*(3), 15-35. https://doi.org/10.24059/olj.v21i3.1231

Parahoo, S. K., Santally, M. I., Rajabalee, Y., & Harvey, H. L. (2016). Designing a predictive model of student satisfaction in online learning. *Journal of Marketing for Higher Education*, *26*(1), 1-19. DOI: 10.1080/08841241.2015.1083511

Park, J. H., & Choi, H. J. (2009). Factors influencing adult learners' decision to drop out or persist in online learning. *Journal of Educational Technology & Society*, *12*(4), 207-217. https://www.jstor.org/stable/pdf/jeductechsoci.12.4.207.pdf?_=1459005475270

Rapanta, C., Botturi, L., Goodyear, P., Guàrdia, L., & Koole, M. (2021). Balancing technology, pedagogy and the new normal: Post-pandemic challenges for higher education. *Postdigital Science and Education*, 3,1-28. https://doi.org/10.1007/s42438-021-00249-1

Redmond, P., Heffernan, A., Abawi, L., Brown, A., & Henderson, R. (2018). An online engagement framework for higher education. *Online Learning*, *22*(1), 183-204. doi:10.24059/olj.v22i1.1175

Reeve, J. (2013). How students create motivationally supportive learning environments for themselves: The concept of agentic engagement. *Journal of Educational Psychology*, *105*(3), 579-595. https://doi.org/10.1037/a0032690

Richardson, J.C., & Swan, K. (2003). Examining social presence in online courses in relation to students' perceived learning and satisfaction. *Journal of Asynchronous Learning Networks, 7*(1), 68-88.

Richardson, J. C., & Newby, T. (2006). The role of students' cognitive engagement in online learning. *American Journal of Distance Education*, *20*(1), 23-37. https://doi.org/10.1207/s15389286ajde2001_3

Richardson, J. C., Maeda, Y., & Swan, K. (2010). Adding a web-based perspective to the self-assessment of knowledge: Compelling reasons to utilize affective measures of learning. *Academy of Management Learning & Education*, *9*(2), 329-334. https://doi.org/10.5465/amle.9.2.zqr329

Richardson, J. C., Maeda, Y., Lv, J., & Caskurlu, S. (2017). Social presence in relation to students' satisfaction and learning in the online environment: A meta-analysis. *Computers in Human Behavior*, *71*, 402-417. https://doi.org/10.1016/j.chb.2017.02.001

Roach, V., & Lemasters, L. (2006). Satisfaction with online learning: A comparative descriptive study. *Journal of Interactive Online Learning*, *5*(3), 317-332. https://eric.ed.gov/?id=EJ1066798

Robinson, C. C., & Hullinger, H. (2008). New benchmarks in higher education: Student engagement in online learning. *Journal of Education for Business*, *84*(2), 101-109. https://doi.org/10.3200/joeb.84.2.101-109

Rockinson-Szapkiw, A. J., Wendt, J., Whighting, M., & Nisbet, D. (2016). The predictive relationship among the community of inquiry framework, perceived learning and online, and graduate students' course grades in online synchronous and asynchronous courses. *International Review of Research in Open and Distributed Learning*, *17*(3), 18-35.

Sahin, I., & Shelley, M. (2008). Considering students' perceptions: The distance education student satisfaction model. *Journal of Educational Technology & Society*, *11*(3), 216-223. https://www.jstor.org/stable/pdf/jeductechsoci.11.3.216.pdf

Seaman, J. E., Allen, I. E., & Seaman, J. (2018). Grade increase: Tracking distance education in the United States. *Babson Survey Research Group*. https://onlinelearningsurvey.com/reports/gradeincrease.pdf

Shea, P., & Bidjerano, T. (2012). Learning presence as a moderator in the community of inquiry model. *Computers & Education*, *59*(2), 316-326. https://doi.org/10.1016/j.compedu.2012.01.011

Shen, D., Cho, M. H., Tsai, C. L., & Marra, R. (2013). Unpacking online learning experiences: Online learning self-efficacy and learning satisfaction. *The Internet and Higher Education*, *19*, 10-17. https://doi.org/10.1016/j.iheduc.2013.04.001

Shih, P. C., Muñoz, D., & Sánchez, F. (2006). The effect of previous experience with information and communication technologies on performance in a Web-based learning program. *Computers in Human Behavior*, *22*(6), 962-970. https://doi.org/10.1016/j.chb.2004.03.016

Swan, K. (2001). Virtual interaction: Design factors affecting student satisfaction and perceived learning in asynchronous online courses. *Distance Education*, *22*(2), 306-331. https://doi.org/10.1080/0158791010220208

Swan, K., Garrison, D. R., & Richardson, J. C. (2009). A constructivist approach to online learning: The community of inquiry framework. In C. R. Payne (Ed.), *Information technology and constructivism in higher education: Progressive learning frameworks* (pp. 43-57). IGI global. https://doi.org/10.4018/978-1-60566-654-9.ch004

Truhlar, A. M., Walter, M. T., & Williams, K. M. (2018). Student engagement with course content and peers in synchronous online discussions. *Online Learning*, *22*(4), 289-312. https://doi.org/10.24059/olj.v22i4.1389

Wang, C. H., Shannon, D. M., & Ross, M. E. (2013). Students' characteristics, self-regulated learning, technology self-efficacy, and course outcomes in online learning. *Distance Education*, *34*(3), 302-323. https://doi.org/10.1080/01587919.2013.835779

Wu, D. T., Wu, K. Y., Nguyen, T. T., & Tran, S. D. (2020). The impact of COVID-19 on dental education in North America—Where do we go next?. *European Journal of Dental Education*, *24*(4), 825-827. https://doi.org/10.1111/eje.12561

Yoo, S. J., & Huang, W. D. (2013). Engaging online adult learners in higher education: Motivational factors impacted by gender, age, and prior experiences. *The Journal of Continuing Higher Education*, *61*(3), 151-164. https://doi.org/10.1080/07377363.2013.836823

Learning How to Teach Languages Online: Voices from the Field

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Abstract
At this moment, fully online language courses are being taught all around the globe. In addition, blended courses offer an integration of online and live instructional experiences. This study examines who is instructing online language courses and what they point to as additive and advantageous to their online language teaching development. We set out to survey higher education faculty as to how they developed their knowledge and practices. Through an online survey and follow-up synchronous interviews, we asked practicing online language educators about the sources of their expertise. The resulting dataset has much to inform professional development and instructional support generally, as well as broader research and educator communities regarding the ongoing, open-ended, peer-supported, and social nature of this kind of educator learning. As more language educators move their instruction online, the question of how to maximize the pedagogical potential of the new medium can best be addressed by those who have successfully made and embraced this move.

Keywords: Online language teaching, professional development in online teaching, learning to teach online, teaching languages online.

As we know from studies in adult learning, expertise develops in any number of ways with and without formal, institutional support (Bruner, 1996; Lave & Wenger, 1998; Lindeman, 2015; Mezirow, 1991). Access to formal coursework and workshops designed to train educators to teach online is on the rise as is access to informal mediums, materials, and self-instruction through internet sites and social media. Institutional offerings, self-paced online training modules, conference workshops, MOOCs, and for-credit coursework are widely available to those seeking to develop their knowledge and skills in online teaching. Similarly, the number of self-taught online educators is growing given the array of readily accessible information, materials, and independent learning opportunities freely available on the Internet (Meskill et al., 2020).

Forced migration to online teaching due to the global pandemic has also brought educators to seek instruction in how to teach online (Schrenk et al., 2021). Teaching expertise, whether developed through formal instruction, informal self-initiated instruction or some combination of the two, is typically viewed as a merger of content knowledge, pedagogical knowledge, and social knowledge (Freeman, 2009; Johnson, 2009). For language educators, the honing of content expertise can be viewed as sharp listening, reading, and noticing skills when it comes to linguistic phenomena (Meskill & Anthony, 2015). That is, content is comprised of the target language and the worlds of meaning that get expressed through it. A language educator's major responsibility is to render these worlds comprehensible and guide learners to successfully interact in them using their new language. Further, because communication cannot be viewed otherwise, social knowledge comes at the intersection of content and pedagogy as the assignments and activities that language educators design and orchestrate are eminently social in nature. Given such foundations, the goal for online language educators is to be well equipped to make constructive, moment-by-moment pedagogical decisions. In language education, this decision-making is informed by a rapidly expanding knowledge base concerning the social and communicative dimensions of mastering another language (Gee, 2004; Johnson, 2006) along with how these are best instantiated in online venues (e.g., Baumann et al., 2008; Meskill & Anthony, 2015). This study explores how practicing online language educators developed the competencies they deemed necessary to do this work. As such, we pose the following research questions:

1. How do post-secondary online language educators develop initial and subsequent online teaching practices?

2. How do post-secondary language educators make use of peer collaborations, formal instruction and/or modeling in learning to teach online?

Literature Review

Professional development in how to design and teach online courses has been researched from a range of perspectives. In the past decade, opportunities to complete formal instruction in online language pedagogy are increasingly available through educational institutions and via government and commercial agencies. Research examining the efficacy of this instruction remains scant. Empirical research remains limited to examining teacher attitudes towards specific learning experiences and rarely extends to determining the efficacy of professional

development experiences on participants' ability to teach well online (Leary et al, 2020; Nazari & Xodabande, 2020; Shin & Kang, 2018). Forms of formal instruction that make up the current research base in this regard include 1) observation of others teaching online (models and affordances); 2) learning by doing, and 3) peer collaborations.

Models and Affordances

Whyte's 2011 study illustrated the value of participants observing and comparing the online language teaching practices of others. Based on participant feedback, the authors cautioned the need to guide educators while they observed others teach so that they could appropriately identify the match and mismatch of technological affordances with pedagogical practices: "Educators can and do self-train with new technology but cannot identify the affordances of the new tools unless they receive help in identifying effective langu015age learning practices" (Whyte, 2011, p. 291). The ability to recognize the alignments between technological affordances and elements of effective practice was also the subject of a study by Pineda et al. (2016). This study of online language teacher professional development reported that at the close of a professional development sequence, participants were able to put into practice specific online language teaching competencies that involved identifying, orchestrating, and assessing online activities (Pineda et al., 2016). Further, in a study that examined the combined approaches of observation and reflection, a Cambodian project had new and practicing online English educators participating in seven asynchronous online language courses while reflecting on these in their personal blogs. Competencies associated with aligning technological affordances and their appropriate pedagogical uses constituted a predominant feature in participants' reflections (Houterman, 2017). Research in teacher education consistently affirms that educators, especially novice educators, tend to teach the way they were taught (Almarza, 1996; Borg, 2003; Feinman-Nemser & Flodden, 1986). Many language educators, however, lack access to practical examples and models as they have not learned languages online themselves (McNeil, 2016). In their examination of teacher education sequences, Stürmer et al. (2013), for example, found the use of video models of pedagogical/conceptual knowledge in action to be the most additive aspect in terms of nurturing and sustaining professional vision. Additional research provides evidence of professional growth being most strongly manifest when videos of classroom teaching were used as models and reflective springboards for developing and reasoning about pedagogical knowledge (van Es & Sherin, 2002).

A key aspect of online language teaching models is representing how the medium can best be used for social exchanges (Meskill & Anthony, 2015; Meskill & Anthony, 2018). For instance, Cook's study of professional development for online teaching illustrated how situated learning experiences not only allowed the instructor to teach explicit knowledge but also to model online social interactions:

> (Through) debate, conflict, and sometimes battle in the course archive, prospective instructors experienced struggles similar to those their own students may exhibit when learning online. Although this experience may not completely prepare them with specific solutions for moderating or resolving students' struggles, it can help them to recognize that such conflicts are intrinsic to writing and learning …and, therefore, to be expected when students choose to learn online (Cook, 2007, p. 74).

Learning by Doing

In terms of learning through hands-on instruction, Liu and Kleinsasser (2014) described the results of a 10-month cross-tier online professional development sequence integrated into a teacher training program. The program involved Taiwanese preservice and in-service English as foreign language educators interacting with one another playing the roles of educators and their students. The study suggested that such novice‑expert partnerships could bring insight and understanding concerning professional growth, practical teaching implementations, and their outcomes. An additional study of formal teacher preparation for online language teaching found success using "authentic project-based learning, preferably embedded within their own context" (Dabner et al., 2012, p. 73). In Adnan's (2018) examination of a professional development sequence for online language teaching, participants reported that, to enhance their traditional roles, they needed to develop competencies for online learning environments and active practice in real-life applications.

Ernest et al. (2013) reported on an online teacher development project based on "learning by doing" which enabled participants to assume the role of a student. In this way they could directly experience the impact of online teacher discourse and how it shaped (or didn't shape) learning. Participants gained from first-hand experience with the affordances and pitfalls from a student's perspective. They pointed to this form of modeling as a particularly contributive element to their learning. Likewise in a study of seasoned English as a Foreign Language educators new to the notion of teaching online, Meskill and Sadykova (2011) found that having these educators observe others teaching their students in an online fishbowl format helped them better conceptualize online venues as places for student-centered, communication-rich language learning. Finally, in a study examining teacher appropriation of modeled online instructional conversations, Meskill and Anthony (2007) found that "readings, discussions, simulated practice, and reflections concerning engagement in instructional conversations can indeed foment awareness of the anatomy of effective online instructional conversations for foreign and second language instruction" (p. 5).

Peer Collaborations

Peer collaborations in the form of profession-focused discussion are widely advocated as a generative form of professional development (Arnold & Ducate, 2006; Barab et al., 2004; Kohnke, 2021; Lantz-Andersson et al., 2018; Meskill et al., 2020; Macià & García, 2016; Vinagre, 2017). In the last decades, social media and social networking have opened up vital channels for peer-to-peer professional development opportunities. Through informal online special interest groups, moderated discussions via professional organization sites, and shared commentary opportunities via social media, new and practicing educators learn about and from one another's practices. To determine whether and how online language educators made use of such opportunities, Colibaba et al. (2012) surveyed online language educators about their uses of social media to support their teaching. The vast majority of respondents reported using social networks to talk to colleagues and share resources, to learn about work-related seminars, courses, and webinars and to participate in their own network of professional contacts (Colibaba et al., 2012). Use of social networking has been found to support language educator development generally (Albion et al., 2015), especially its vitalizing aspect when participants serve as experienced mentors to new online educators (Liu & Kleinsasser, 2014).

The present inquiry into the professional development strategies used by post-secondary language instructors making the move to online instruction provides a working framework based

on reported experiences. Our findings on the approaches these educators favored in an effort to better understand the online medium's affordances and applications offer insight into the how and what of their processes. These insights and accounts can inform the design of professional development as well as inform practicing online language educators about useful sources and strategies.

Methodology

The study was guided by the following research questions:

1. How do post-secondary online language educators develop initial and subsequent online teaching practices?
2. How do post-secondary language educators make use of peer collaborations, formal instruction and/or modeling in learning to teach online?

To address these questions the authors developed an online survey (Appendix A) that consisted of 1) two questions related to language teaching experience and online teaching experience, 2) a question to record the format of online teaching (fully online, blended or both), 3) a question to elicit participants' sources of knowledge and skills, and 4) an open-ended question regarding how respondents' prior learning experiences influenced the ways they teach online. To increase reliability and validity, the questions were based on research related to possible sources of professional development in online instruction. By including open-ended question #5 and an option "other" in question #4, participants could express their own thoughts and experiences concerning how their online teaching practices evolved.

Our aim was to involve as many higher education language educators from around the world as possible. A link to the anonymous online survey was emailed to approximately 1,500 individuals whose email addresses were retrieved from (a) college and university emails listed in the course schedule sections on official web sites, and(b) individual emails of authors who have published on the topic in peer-reviewed scholarly journals such as *Language Teaching & Technology*, *CALICO*, *CALL*, and *System*.

The aggregating site HigherEd360 (Colleges & Universities Employment Pages and Profiles, n/d) was used to access web sites of institutions of higher education. Using the search terms "course schedule" or "class schedule," online language courses were located along with instructor email contacts. The main criterion was instructors' email address accessibility via course search engines and via departmental websites. In addition, the link to the survey was disseminated through professional listservs of organizations concerned with teaching languages or teaching with technologies such as CALICO (the Computer-Assisted Language Instruction Consortium, n/d), MERLOT (Merlot, n/d), , and Dartmouth (Dartmouth, n/d) and via social networks of the authors (Facebook and Twitter).

In total, 174 respondents completed the survey. Among the respondents who completed questions 1 and 2, seventy eight participants (almost 45%) have taught online for more than five years with 45 of them (26%) having over 10 years of teaching languages online experience (Figure 1). Their expertise is particularly important given the range of experiences that inform their responses. Indeed, it is widely recognized that more experienced educators are able to identify critical classroom situations and to draw on their theoretical knowledge to classify and interpret these situations (Palmer et al., 2005).

Figure 1
Years of Teaching Languages Overall and Online.
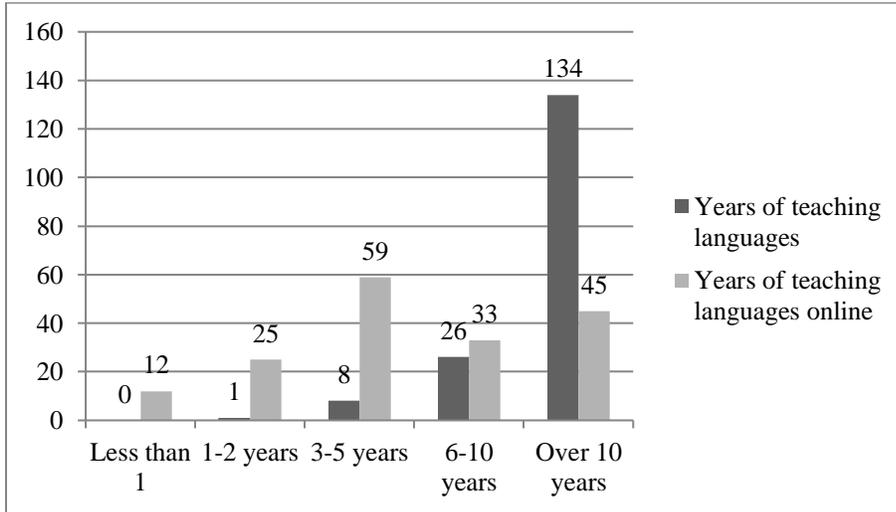
Study participants were also asked to report on modes of online teaching—fully online, blended, or both. Results indicated that 96 respondents (55%) teach in both formats, 61 (35%) only online, while 17 survey participants (almost 10%) teach in a blended format (Figure 2).

Figure 2
Modes of Instruction
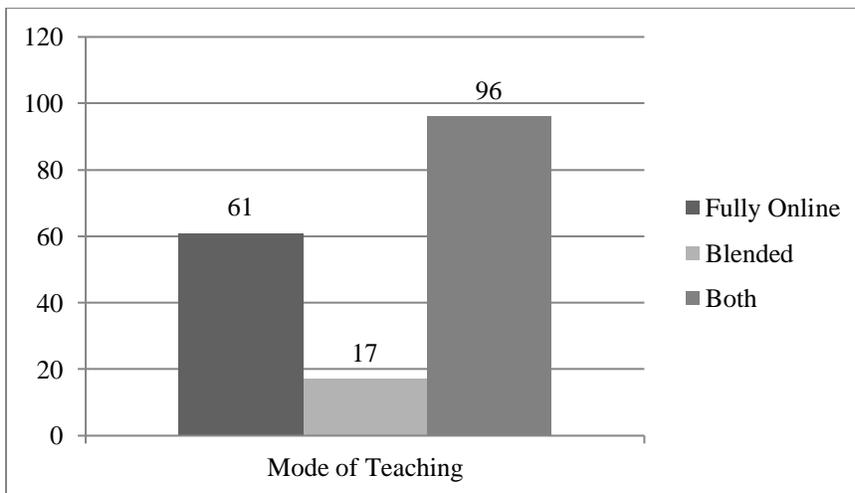
To collect additional, in-depth data for analysis, online interviews were conducted. To recruit participants for the follow-up interviews the final survey question asked for permission to contact those respondents willing to participate. The pool of those who provided their contact information consisted of 96 educators. Twenty respondents were purposefully selected out of that pool to ensure a range of participant online teaching experiences but keeping the number of interviews practical for the current study. Nine of the selected were then able to schedule a synchronous online interview via Abobe Connect, which was recorded, transcribed and analyzed.

Table 1 below summarizes the background of the online language instructors who were interviewed. There were two males and seven females. Their college-level experiences teaching languages online varied from 1-2 to over 10 years with most of them teaching Spanish fully online.

Table 1

Participant Information

Interviewees	Gender	Years of Online Language Teaching	Languages Taught Online	Mode of Teaching
Jim	Male	1-2	Spanish/French	blended & fully online
Randi	Female	4	Spanish/Italian	fully online
Kate	Female	6-10	Spanish	blended & fully online
Ellen	Female	3-5	Spanish	blended & fully online
Dana	Female	6-10	Spanish	blended & fully online
Chris	Female	3-5	Spanish/ French	fully online
Frank	Male	3-5	Spanish	blended & fully online
Jane	Female	3-5	French/Arabic	fully online
Fran	Female	over 10	Russian	fully online

The entire dataset was collected in 2019. It consists of 1) 174 responses to five multiple-choice questions, 2) 93 responses to question #4 that asked respondents to specify "What are some of your sources of knowledge and skill when it comes to teaching languages online?" 3) 158 responses to open-ended question #5: "How do you see these prior learning experiences influence the ways you teach online?" and 4) recorded interviews (each from 10 to 28 minutes in length) with the nine online instructors (Table 1). Responses to the four multiple-choice questions were analyzed quantitatively (i.e., in percentages) and plotted visually in relation to emerging themes in the open-ended data. These quantitative data helped us to recognize trends within the overall cohort while also ascertaining how our interviewees' profiles fit in this larger picture and were analyzed using simple Excel percentage comparisons. Answers to the open-ended survey question and interviews went through two rounds of coding undertaken by two researchers independently. In the first round, researchers based their analysis on the three major themes that emerged through the literature review: 1) learning to teach with peers, 2) learning to teach online through formal instruction, 3) learning to teach via models. The first round enabled the researchers to identify a range of codes, such as "self-learning" or "networking." The two coders compared and refined their preliminary findings and initiated a second round of coding that enabled them to iteratively group the findings into eight categories presented in the Results subsections to follow.

The study design ensured the collection of rich data from several sources that were analyzed quantitatively and qualitatively by the authors. While this contributed to the validity and reliability of study findings, they are limited in terms of generalizability due to our sample size and because survey participants came from a convenience sample rather than a probability one. To mitigate limitations and increase transferability of results, the selection of interviewees was controlled for online teaching experience (from beginners in online teaching to experienced online instructors) and for the format of teaching (fully online or blended and fully online).

Results

To understand how online language instructors develop their craft, survey respondents were asked the following question: "What are some of your sources of knowledge and skill when it comes to teaching languages online? (Select all that apply)." Respondents selected one or several of the seven choices while also specifying 'other' responses (see Figure 3). Results indicate that respondents develop knowledge and skill related to teaching languages online in several ways. Reflection on practical experiences, conferring with colleagues/peers, and online resources are the three most frequently reported responses: 86%, 79%, and 78% of study participants respectively (Figure 3). Conferences and professional development workshops are also important sources of knowledge and skill for 60% and 53% respectively. Books and articles in the field, indicated by 39% of respondents, are important means for enriching professional skills. Only 29% received formal education through workshops and courses provided by their institutions.

Figure 3
Results for the Survey Question "What are Some of Your Sources of Knowledge and Skill When it Comes to Teaching Languages Online? (Select All That Apply)"
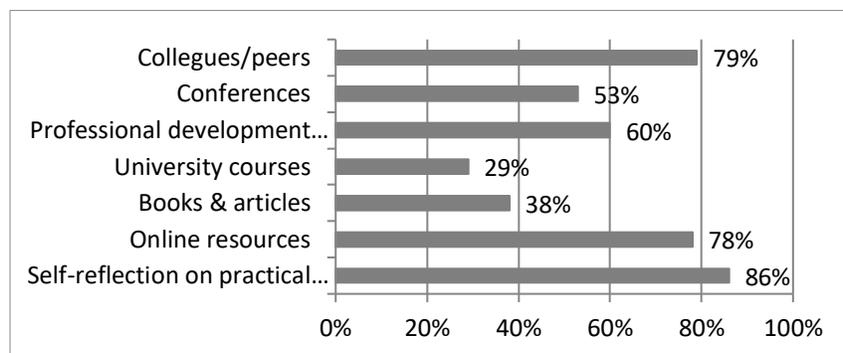
Instructor Strategies: How

Analysis of the qualitative dataset—open-ended survey questions and transcriptions of the nine online interviews—generated overarching themes, subthemes and their interrelationships as represented in Figure 4. Responses generally fell into two broad categories: *how* respondents learned to teach online and *what* they learned. Predominant themes within each of these two categories will each be illustrated and elaborated on in the sections that follow. Finally, the periphery of Figure 4 provides further elaboration while indicating the interrelationships we found between major themes.

Figure 4

Thematic Categories for Learning to Teach Languages Online
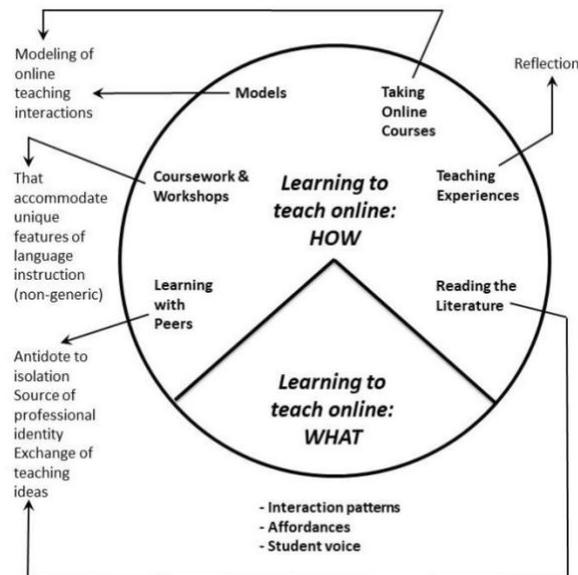
Taking online courses. Many respondents cited their experiences taking courses as students, especially online *language* courses, as formative and informative as regards their own online teaching repertoires. To try to walk in the shoes of online learners was cited as an extremely valuable way to become a better online language educator. Comments included what their online educators did wrong and how they had learned from such negative examples of online instruction:

> I've taken a few online courses where the only feedback the instructor provided was Good Job! This is unacceptable. I want my students to know that I take their learning and my teaching seriously because I do. (survey respondent)

> I have taken a lot of online classes and my experiences in those courses have shaped my own courses. I take what I liked as a student and use that but avoid doing the things that created stress when I was taking courses online. (survey respondent)

> I had taken some online classes and I was frustrated with the set-up of the class and lack of attention to enticing me to the information. I wanted to change that. I still want to change that. (survey respondent)

Design and teaching weaknesses were not the only source of learning from the perspective of an online student. The experience overall was widely deemed valuable in making future pedagogical decisions. As one survey respondent articulated, "One of the most useful things is to take web-based and hybrid courses oneself and have the students' experience." Indeed, experiencing online teaching from the students' perspective is seen as a productive means of

becoming familiar with online affordances and concomitant pedagogical potential and several respondents reported this being the case in their development.

Classroom experiences. Traditional in-person classroom experience also appears to serve as an important resource for many online language educators and was cited as a major source of knowledge and skill. One survey respondent, for example, stated: "You help them to improve because of your experience. That doesn't come from the course, that comes from your experience teaching languages." Another survey participant agreed: "My having taught these courses in person was what made it possible to develop the online sister course."

While many online instructors cited their traditional classroom experience as informing their transition to online teaching, one survey respondent stated:

> I find that the most important part of teaching online is to NOT want to replicate past teaching practices (at least not necessarily) but instead to investigate what the affordances of new technological tools are and envision what new forms of pedagogies can be deployed.

Many respondents reported that they are "self-taught" through trial and error. As one survey respondent put it: "practice makes perfect!" and goes on to say

> Having extensive classroom experience, part of the learning process when creating an online course is understanding not only what is generally effective (e.g. domain-specific pedagogy, best practices. etc.), but also what must be tailored to an online environment and cohort. Just as my face-to-face teaching goes through several iterations, so too does my online teaching as I learn from trial-and-error.

During his interview, Chris emphasized the experimental nature of developing online teaching skills. "It's all experiential, try things out; work through it, see how it works." Some respondents reported having learned what works from their students—through course evaluations: "My first one [online course] was abysmal, I had to do something!" (Kathy, interview). And Dana lamented that the "language classes developed by her Instructional Technology services were awful, I had to do it my own way!"

Survey comments underscore the trial and error aspect involved in developing as an online language educator:

> Tweaking and improving on what I'm already doing as I learn what works and what doesn't from my students! (survey respondent)

> It's trial and error. I'm constantly adding and discarding ideas! (survey respondent)

> I have drawn from experiences to formulate methods and by trial and error have seen what seems to work and what I can tweak to make a more engaging environment for students. (survey respondent)

> I think seeing how students interact with the material has been the greatest teacher. (survey respondent)

These observations are consistent with a rare study of a self-taught online language educator. In a close examination of his own self-instructed online language teaching, Lewis points to the trial and error aspects when it came to how to handle the technology's affordances, course management issues and the fact of student and teacher anxiety using the target language (Lewis, 2006).

Reading the literature. Although anecdotally prevalent, there is little research on the impact reading professional literature has on instructional practice. Kamiya and Loewen (2014), however, did determine some influence related to reading relevant literature in Teaching English as a Second Language (ESL) professional development contexts. In our study, a wide range of professional publications were cited by both our survey and interview respondents. For example, one of our survey respondents reported that she learned best "from the tons of literature I've read." She goes on to point specifically to "case studies and field narratives" as being the most impactful for her in her online teaching. Another survey respondent wrote that reading professional literature gave her a sense of community: "Reading lots of articles helped me feel less isolated in this field."

Data indicate that reading professional literature is routine for many. It is sometimes associated with doing research, something that many study participants reported undertaking:

> I read, I research, and I look for all opportunities to enrich my knowledge and increase my competence at online language instruction. (survey respondent)

> Books: I have a list too long to list here! I buy new ones each year. (survey respondent)

> All books I review for journals and all articles that interest me (asking me to list them here is undoable). (survey respondent)

There is certainly no shortage of publications about teaching languages online. From scholarly research journals to practitioner-oriented publications, those with motivation to independently develop their skills and understandings have vast opportunities to do so. In addition to formal research articles, practitioner websites offer readings for those seeking knowledge and practical ideas. Many respondents reported drawing on this wealth of resources.

Learning via peer collaboration. In her interview, Kate underscored her initial sense of isolation and lack of accessibility to what she needed to know in order to become an accomplished online language educator. Eventually she stumbled upon an online peer who became her informal mentor and, eventually, a vital influence in her professional development.

> I had to learn as I go. I took a maternity leave as I was designing, so had time to think about [my courses]. I interviewed an instructor who taught online – the only person I could find, she generously shared her ideas, sent me screen shots…

Interaction between and among community members is foundational to the professional growth of educators (Borko, 2004; Hadar & Brody, 2013; ten Dam & Blom, 2006) and can be greatly supported and enhanced via online collaborations and consultations. Such connection and community help interlocutors shape their sense of self as professional educators and reinforce continually evolving online identities. Online environments, especially social media, represent natural sources of knowledge about online teaching: "I have learned new skills thanks to hundreds of students and instructors online" (from survey). This statement is echoed by several other respondents:

> A lot of thinking and talking with my peers about how to do it and how to make the entire process better and closer to face to face experiences was important. (survey respondent)

> Talking to other instructors was helpful in the way it showed me how they go through the same issues and struggles I'm experiencing. (survey respondent)
> Working with mentors, peers, and mentees, developing new curriculum and improving existing ones. (survey respondent)

Frank is an active member of his state-wide professional organization where he networks with other online language educators to "swap activities, texts." Dana reports that she enjoys sharing with colleagues through webinars and when attending conferences where idea sharing is generally encouraged. She also "share(s) ideas on listservs, professional organizations, Facebook, informal idea exchanges" and similar.

The 'just-in-time' aspect of access to knowledgeable peers was also cited as invaluable by survey respondents:

> It has been very helpful to know I have someone with experience that I can call and request from. (survey respondent)

> My colleagues and mentor have set up excellent programs, and I find when I follow their models and practices, my students do better. (survey respondent)

> The field is under construction, I talk to colleagues, ideas from colleagues as to what work. (Frank, interview)

The power of such peer support has been reported elsewhere as a highly preferred means for educators to learn how to utilize technology in education (Meskill et al., 2020).

Learning via coursework and workshops. As indicated earlier, formal training for almost 60% of respondents took the form of professional development workshops (Figure 3). Study participants indicated that they frequently took advantage of opportunities such as professional development courses and workshops. These were often organized by professional organizations such as ACTFL, CALICO, EUROCALL or IALLT. Online workshops and webinars were also popular means for professional growth. Language educators with substantial online teaching experience also told stories of not having had access to formal training opportunities nor institutional support for moving their courses online "back in the day." One

survey participant compared past and present opportunities for training:

> Our campus has ongoing workshops and individual help for the technologies we use in online teaching that is available year round. This was not always the case, however, and there have been nasty bumps along the road at times. (survey respondent)

One long-term veteran of language and technology, Chris, emphasized the importance of constant engagement in professional development in new technologies. She sees an ongoing need for new skills in understanding online affordances to be fresh and responsive to learners' needs. In terms of her own professional development, Chris reported that "the university had an initiative to support faculty training and presented broad ideas of online teaching and learning but language teaching is different, so I learned mostly on the fly."

Randi's institution offers a generic training package for online educators. She reports having taken advantage of all trainings possible, having been "motivated to change" after receiving far from flattering student evaluations on her first online course. "I was a literature major. I had had one methods course!" Two emphases the training that Randi reports having strongly influenced her online instruction were 1) student centeredness; and 2) emphasis on authentic experiences. She tailors activities in her language courses to fit individual student's learning and she often has her students undertake virtual visits to Spanish institutions and popular venues for authentic target language immersion.

At Frank's institution there is a certification program with three self-paced online courses which he completed and then went on to "design the course with help of ITS (Instructional Technology Services). I need technology to find a way to accommodate my teaching needs as a language educator. The more questions I asked, the more they accommodated."

However, interviewees and survey respondents were mixed concerning the efficacy of institutionally provided professional development chiefly because these offerings rarely addressed *language* instruction. Most reported having taken online workshops, some self-sought, most institutionally provided and, often, courses on online instruction in general:

> Workshops are fundamental, but piecemeal. While best practices in distance education in general is a well-developed area of study, teaching languages and cultures online is still in a nascent stage. (survey respondent)

> Primarily in making me aware of specific tools and strategies for online teaching that would take me a long time to locate and evaluate on my own. (survey respondent)

Language textbook publishers and software distributors also supply formal training for online educators. A handful of study participants cited these as something they had completed as part of their training. Going beyond technology-oriented professional development, Frank, clearly a socially and communication-oriented instructor, reported that a theater workshop had helped him prepare for the kind of lively interaction he enjoyed orchestrating with his students online.

Ellen reported how she "figure(d) out a lot of work-arounds, you have to, everything is so new, lots of the tech experts can't answer my questions, I ask lots of how to questions with language teaching knowledge in my head." Finally, one survey respondent who self-identified as technologically savvy was adamant that "when it comes to actual EDUCATION, many of the

whiz-bang online learning tools that publishers and commercial developers are using are NO MORE EFFECTIVE than the old Apple IIe programs I used decades ago."

Learning via models. Study participants frequently cited models—former educators or colleagues and/or exemplars of teaching online—as a critical source of their professional development.

It is helpful to see other courses to get ideas of what works well for others. (survey respondent)

I take what I liked as a student and use that but avoid doing the things that created stress when I was taking courses online. (survey respondent)

One participant reported using YouTube videos extensively to seek out models of effective online teaching. "Even videos of live classrooms like Khan Academy help me think more about what I do and how (survey respondent). Another source of models was former instructors. Dana, in particular, spoke of her role model with great reverence and enthusiasm:

The role model for teaching was my statistics professor who was clear about his objectives. I do this for my students: clear instructions and objectives—no complicated language.

When discussing the most important influences in her development as an online language teacher, Ellen states unequivocally that she teaches "the way I was taught." Kate too reports teaching "the way I was taught, don't like boring approaches, make it fun." This was a common theme throughout our data. This underscores the fact that the large portion of our lifetimes that we spend as students cannot help but influence our ideas of what it means to be an educator.

Instructor Strategies: What
Modifying interaction/feedback patterns. For many respondents, their direct experience teaching languages online resulted in the need to change their patterns of instructional interaction and feedback: "They [the medium's affordances] inform both how I design online instruction and how I interact with colleagues and students in the online environment." They reported shifts in interactional patterns due to the environment and its affordances:

Importance of communication and interaction between students, and between me and the students. (survey respondent)

I spend a lot of time on providing feedback to the students on the assignments that are challenging and that require their time and effort. (survey respondent)

And rethinking the interactional structures of their teaching:
I think about how to make online engaging-- as if you are in a classroom and need to answer/ want to join in. That's difficult! So my YouTube channel can help, or a fun/ extra email with a link, besides extra reminders and hellos. I want them to

know I am thinking about them and I'm "present" in their class experience. (Survey respondent)

Respondents learned the importance of teacher presence and active engagement with and between students and that this often requires extra effort: "It's all about generating ideas for course design that engages students and creates active learners." Another respondent indicated that while learning how to teach online she was able to see how to empower her students' learning agency:

It is a lot easier with today's technological tools to turn one's students into authors that are given the opportunity to use language in public-facing discursive communities (e.g., discussion boards, blogs, video hosting sites, fan fiction sites, book writing sites). (survey respondent)

Affordances. Learning how to teach online for many study participants meant learning about new forms of technology and this, of course, changed their views of technology as a language teaching tool. While some survey and interview respondents expressed frustration with how technical limitations constrained their teaching, others expressed passion for the products their institutions chose to adopt. As one survey respondent opined: "I adore [Canvas, Bb, etc.]." The majority lauded the inherent personalization of communicative affordances of the online medium and the high quality opportunities for students to exercise and develop their voices in the new language.

Finally, for participants with several years of experience with online language instruction, there was clear recognition concerning the ongoing nature of professional development. In this way one continues to be a learner of teaching and pedagogical design, a notion expressed by several participants. One survey respondent in particular noted the flexibility that was required due to the disorderly nature of the craft: "The field is in a state my colleagues and I call 'permanent disruption,' therefore I am always willing to change and make adjustments." Another noted how teaching online requires keeping up with changing technologies and students: "It's all process. My online teaching is always morphing as affordances, contexts and populations change." While another mentioned how educators, like students, grow with time and experience:

I think just as students we grow as time passes. All of the experiences and information I see helps shape my teaching practices. Continued learning is key to sustaining and improving success as online instructor. (survey respondent)

Discussion

Recent shifts in educator professional development, away from prescriptive "best practices" towards viewing teaching as an ongoing, transformative endeavor, are gaining traction (Curran & Murray, 2008; Hawkins, 2004; Johnson, 2006). The results of our inquiry on how post-secondary language educators learn to teach online speak to the individuality, energy, diversity and sustained motivation of these educators and their commitment to serving their students' language learning needs in ways that make sense to them. Study participants report a variety of means whereby they develop such knowledge and skills and what experiences they see as important in developing as effective online language educators. In terms of how they did so, respondents report that they sought out *learning with peers*, *learning through formal instruction, learning via models, and experience with reflection* as primary strategies.

Learning with Peers

Elaborating on the role of peer learning, respondents emphasized the aspect of isolation when teaching online and how peer networking and reading publications in the field can be antidotes to that isolation. Moreover, growth and development thrive on professional interactions and, as some respondents indicate, such interactions contribute to their sense of professional identity as well as their teaching repertoires. Finally, respondents lauded the practice of sharing and swapping teaching ideas and materials via social networks, an area ripe for professional development design research.

Formal Instruction

In addition to learning with peers, our respondents highlight two missing pieces of the formal instruction available to them: 1) the fact that so little addresses the unique needs and characteristics of *language* instruction; and 2) that professional development needs to be ongoing and on-demand, "not a one shot deal" as one respondent expressed it. Clearly, entities responsible for providing instructor development and support need to be clear that teaching languages online is fundamentally different from teaching other subjects and that specialized course and workshop design should be implemented accordingly. The theme of the continual need for growth, development, and instructional support when teaching languages online consistently runs through these data as well. Formal professional development experiences reported here were one-time closed curricula: a set of material at the end of which one has purportedly gained sufficient knowledge to go on to perform adequately. However, developing skills and knowledge to teach languages online is complex and dynamic. For these dedicated professionals, it has no end point. Participants reported learning a great deal from their students' responses to their teaching, a key component which is, by nature, ongoing (Cochran-Smith & Lytle, 1999; Johnson, 2006; Stein et al., 1999) as is ongoing learning with, through, and from peers. This is strongly reflected in the contexts of ongoing collegial exchange, just in time learning, and in the experimental aspects of the enterprise. Implications for course and workshop providers are clear: follow-on and follow-through are critical components of professional development as so much of what is learned about teaching online is learned by doing. On-demand, after-the-fact instructional support is vital. Institutional forms of faculty support would do well to recognize such preferences and incorporate ongoing collaborations into their formal offerings.

Learning Through Models

As for the third primary source, learning to teach online via models, our respondents could not have been more explicit concerning the centrality of this feature in their learning and development. While echoing the extant literature regarding video recordings of model teaching and teaching the way one is taught, participants underscored the value of being a student in more than one online course. As online students they could directly experience the unique practices that the online venue affords as well as mistakes that can be made.

Experience and Reflection

Beyond learning with peers, formal instruction and models, our participants discussed the centrality of experimentation in their online teaching. Indeed, a full 86% of survey respondents pointed to *self-reflection on practical experience* as their most valued form of development. The medium and its affordances being relatively new, experimentation would be expected and, within

formal learning and institutional structures, supported and encouraged. Many also reported that it was in the traditional classroom where they had developed foundational skills in understanding students' language learning processes and the best way to guide and facilitate these. Modifications were necessitated by the fact of online structures and constraints. Respondents articulated how patterns of interaction had to thereby change, most often for the better, online. For many, synchronous and asynchronous conversations between students and students and students and their teacher became venues ripe for authentic, motivated language practice where all students could exercise their voices in the target language.

Implications

What is noteworthy for this group of respondents is that they clearly value the human dimension of online teaching over the technological. Participants' reports and reflections are far less technology-oriented than typical institutional online training offerings would imply. The totality of their responses begs the question, what and how much do online language educators need to know about technology per se? Early in the brief history of professional development for online language education, it became clear what kinds of professional development would *not* be useful: namely, courses that focused on developing basic computer skills and learning the specifics of various Learning Management System's (LMS) tools and features (Compton, 2009). Many respondents reported having availed themselves of their institutions' generic LMS training opportunities to learn how to operate the software with which they were supplied. Others said they opted to seek on-demand answers to their technology questions via the internet. This again underscores the ongoing, experimental aspect of learning to teach online. Transmission of knowledge approaches to educator training rarely acknowledge and properly support the transformation to educators' sense of professionalism that results from moving from traditional classroom-based teaching to online teaching. The shift goes beyond the acquisition of technical skills and requires pedagogical understanding of the medium's affordances and an acceptance of one's accompanying new roles and identities (Comas-Quinn, 2011, 2012; Kanno & Stuart, 2011).

Study participants report seeing value in working with others, in collaborating and developing ideas dialogically rather than being handed formulae. For this group, expertise in online teaching develops collaboratively with educators exercising their own developing voices and visions. Data also suggest that such forms of collaboration should be ongoing as growth and improvement in online teaching skills never cease. Indeed, the majority of study participants underscore this in their responses: ongoing learning with, though, and by peers, observations/modeling and the exchange and development of ideas comprise their preferred approaches in learning to teach languages online. Institutional forms of faculty support would do well to incorporate such preferences and foci into their offerings.

Conclusion

As more language educators come to teach online and/or are initially trained to teach online, research that tracks their processes and learning outcomes is vital. Future research in this domain might include longitudinal investigations of professional development activities, processes, and outcomes as reflected in language course design and student learning. From this group of language educators, we see both consensus and novel insights through which recommendations for language educator support can be made and new areas of inquiry established. Two of these—the ongoing and social nature of professional development for online

language instruction—should be recognized, institutionally instantiated, and researched in ways that parallel our ever-changing understandings about teaching with technologies.

References

Adnan, M. (2018). Professional development in the transition to online teaching: The voice of entrant online instructors. *ReCALL, 30*(1), 88-111. https://doi.org/10.1017/S0958344017000106

Albion, P. R., Tondeur, J., Forkosh-Baruch, A., & Peeraer, J. (2015). Educators' professional development for ICT integration: Towards a reciprocal relationship between research and practice. *Education and Information Technologies*, *20*(4), 655-673. https://doi.org/10.1007/s10639-015-9401-9

Almarza, G. (1996). Student foreign language teacher's knowledge growth. In D. Freeman, & J. C. Richards (Eds.), *Teacher learning in language teaching* (pp. 50-78). Cambridge University Press.

Arnold, N., & Ducate, L. (2006). Future foreign language educators' social and cognitive collaboration in an online environment. *Language Learning & Technology, 10*(1), 42–66. http://dx.doi.org/10125/44046

Barab, S.A., MaKinster, J.G., & Sheckler, R. (2004). Designing system dualities: characterizing an online professional development community. In S. Barab, R. Kling, & J. H. Gray (Eds.), *Designing for virtual communities in the service of learning* (pp.53-90). Cambridge University Press. https://doi.org/10.1080/01972240309466

Baumann, U., Shelley, M., Murphy, L., & White, C. (2008). New challenges, the role of the tutor in the teaching of languages at a distance. *Distances et Savoirs*, *6*(3), 365-392. https://www.cairn.info/revue-distances-et-savoirs-2008-3-page-365.htm

Borg, S. (2003). Teacher cognition in language teaching: A review of research on what language educators think, know, believe, and do. *Language Teaching, 36*, 81–109. https://doi.org/10.1017/S0261444803001903

Borko, H. (2004). Professional development and teacher learning: Mapping the terrain. *Educational Researcher*, *33*(8), 3-15. https://doi.org/10.3102/0013189X033008003

Bruner, J. (1996). *The culture of education*. Harvard University Press.

Can, T. (2009). Learning and teaching languages online: A constructivist approach. *Novitas-Royal*, *3*(1), 60-74. https://www.researchgate.net/publication/26605646_Learning_and_Teaching_Languages_Online_A_Constructivist_Approach

Cochran-Smith, M., & Lytle, S.L. (1999). Relationships of knowledge and practice: Teacher learning in communities. In A. Iran-Nejad, & C. D. Pearson (Eds.), *Review of research in education* (Vol. 24; pp. 249-305). American Educational Research Association.

Colibaba, A., Vlad, M., & Peterscu, L. (2012). Online learning for foreign language educators: using social networking for creating autonomous personal learning networks. In Proceedings of the 8th International Scientific Conference eLearning and Software for Education (Vol. 2, pp.391-396). Universitara Publishing House.

Colleges & Universities Employment Pages and profiles for 2,700 colleges and Universities. HigherEd360. (n.d.). https://www.highered360.com/hr/

Comas-Quinn, A. (2011). Learning to teach online or learning to become an online teacher: An exploration of educators' experiences in a blended learning course. *ReCALL*, *23*(3), 218-232. https://doi.org/10.1017/S0958344011000152

Comas-Quinn, A., de los Arcos, B., & Mardomingo, R. (2012). Virtual learning environments (VLEs) for distance language learning: Shifting tutor roles in a contested space for interaction. *Computer Assisted Language Learning*, *25*(2), 129-143. https://doi.org/10.1080/09588221.2011.636055

Compton, L. K. (2009). Preparing language educators to teach language online: A look at skills, roles, and responsibilities. *Computer Assisted Language Learning*, *22*(1), 73-99. https://doi.org/10.1080/09588220802613831

Cook, K. C. (2007). Immersion in a digital pool: Training prospective online instructors in online environments. *Technical Communication Quarterly*, *16*(1), 55-82. https://doi.org/10.1080/10572250709336577

Curran, E., & Murray, M. (2008). Transformative learning in teacher education: Building competencies and changing dispositions. *Journal of the Scholarship of Teaching and Learning, 8,* 103-118. https://doi.org/10.12691/education-5-10-6

Dabner, N., Davis, N., & Zaka, P. (2012). Authentic project-based design of professional development for educators studying online and blended teaching. *Contemporary Issues in Technology and Teacher Education, 12*(1), 71-114. https://citejournal.org/volume-12/issue-1-12/current-practice/authentic-project-based-design-of-professional-development-for-teachers-studying-online-and-blended-teaching/

Dartmouth. (n/d). https://home.dartmouth.edu/.

Ernest, P., Heiser, S., & Murphy, L. (2013). Developing teacher skills to support collaborative online language learning. *The Language Learning Journal*, *41*(1), 37-54. https://doi.org/10.1080/09571736.2011.625095

Feinman-Nemser, S., & Flodden, R. E. (1986). The cultures of teaching. In M. Wittrock (Ed.), *Handbook of research in teaching* (3rd ed., pp. 505-526). Macmillan.

Freeman, D. (2009). The scope of second language teacher education. In A. Burns, & J. C. Richards (Eds.), *The Cambridge guide to second language teacher education* (pp. 11-19). Cambridge University Press.

Gee, J. P. (2004). Learning language as a matter of learning social languages within discourses. In M. Hawkins, (Ed.), *Language learning and teacher education: A sociocultural approach* (pp. 13-31). Multilingual Matters.

Hadar, L. L., & Brody, D. L. (2013). The interaction between group processes and personal professional trajectories in a professional development community for teacher educators. *Journal of Teacher Education*, *64*(2), 145-161. https://doi.org/10.1177/0022487112466898

Hampel, R., & Stickler, U. (2005). New skills for new classrooms: Training tutors to teach languages online. *Computer Assisted Language Learning*, *18*(4), 311-326. https://doi.org/10.1080/09588220500335455

Hawkins, M. (2004). *Language learning and teacher education: A sociocultural approach*. Multilingual Matters.

Houterman, M. (2017). A new professional learning landscape for English language teaching. *People and Places*, Spring 2017, 56-57.

Johnson, K. E. (2006). The sociocultural turn and its challenges for second language teacher education. *TESOL Quarterly*, *40*(1), 235-257. https://doi.org/10.2307/40264518

Johnson, K. E. (2009). *Second language teacher education: A sociocultural perspective*. Routledge.

Kamiya, N., & Loewen, S. (2014). The influence of academic articles on an ESL teacher's stated beliefs. *Innovation in Language Learning and Teaching*, *8*(3), 205-218. https://doi.org/10.1080/17501229.2013.800077

Kanno, Y., & Stuart, C. (2011). Learning to become a second language teacher: identities-in-practice. *The Modern Language Journal*, *95*(2), 236-252. https://doi.org/10.1111/j.1540-4781.2011.01178.x

Koehler, M., & Mishra, P. (2009). What is technological pedagogical content knowledge? *Contemporary Issues in Technology and Teacher Education, 9*(1), 60-70. https://citejournal.org/vol9/iss1/general/article1.cfm

Kohnke, L. (2021). Professional development and ICT: English language teachers' voices. *Online Learning*, 25(2), 36-53. https://doi.org/10.24059/olj.v25i2.2228

Lantz-Andersson, A., Lundin, M., & Selwyn, N. (2018). Twenty years of online teacher communities: A systematic review of formally-organized and informally-developed professional learning groups. *Teaching and Teacher Education*, *75*, 302-315. https://doi.org/10.1016/j.tate.2018.07.008

Leary, H., Dopp, C., Turley, C., Cheney, M., Simmons, Z., Graham, C.R., & Hatch, R. (2020). Professional development for online teaching: A literature review. *Online Learning*, 24(4), 254-275. https://doi.org/10.24059/olj.v24i4.2198

Lee, L. (2016). Autonomous learning through task-based instruction in fully online language courses. *Language Learning & Technology, 20*(2), 81–97. http://dx.doi.org/10125/44462

Lewis, T. (2006). When teaching is learning: A personal account of learning to teach online. *Calico Journal*, *23*(3), 581-600. https://doi.org/10.1558/cj.v23i3.581-600

Lindeman, E. C. (2015). *The meaning of adult education*. Ravenio Books.

Liu, M. H., & Kleinsasser, R. C. (2014). Fostering online professional development between EFL preservice and inservice educators: Affordances and challenges. 英語教學期刊, *38*(2), 29-64. https://www.researchgate.net/publication/302049510_Fostering_Online_Professional_Development_Between_EFL_Preservice_and_Inservice_Teachers_Affordances_and_Challenges

Macià, M., & García, I. (2016). Informal online communities and networks as a source of teacher professional development: A review. *Teaching and Teacher Education*, *55*, 291-307. http://dx.doi.org/10.1016/j.tate.2016.01.021

McNeil, M. (2016). Preparing educators for hybrid and online language instruction. *Issues and Trends in Educational Technology*, *4*(1). http://dx.doi.org/10.1016/j.tate.2016.01.021

Merlot. (n.d.). https://www.merlot.org/merlot/index.htm.

Meskill, C., & Anthony, N. (2007) Learning to orchestrate online instructional conversations: A case of faculty development for foreign language educators. *Computer Assisted Language Learning, 20*(1), 5-19. https://doi.org/10.1080/09588220601118487

Meskill, C., & Anthony, N. (2015). *Teaching languages online*. Multilingual Matters.

Meskill, C., & Anthony, N. (2018). *Teaching children online: A conversation-based approach*. Multilingual Matters.

Meskill, C., Anthony, N., & Sadykova, G. (2020). Teaching languages online: Professional vision in the making. *Language Learning & Technology, 24*(3), 160-175. http://hdl.handle.net/10125/44745

Meskill, C., & Sadykova, G. (2011). Introducing EFL faculty to online instructional conversations. *ReCALL, 23*(3), 200–217. https://doi.org/10.1017/S0958344011000140

Mezirow, J. (1991). *Transformative dimensions of adult learning*. Jossey-Bass.

Nazari, M., & Xodabande, I. (2020). L2 educators' mobile-related beliefs and practices: contributions of a professional development initiative. *Computer Assisted Language Learning*, 1-30. https://doi.org/10.1080/09588221.2020.1799825

Palmer, D. J., Stough, L. M., Burdenski, T. K., & Gonzales, M. (2005). Identifying teacher expertise: An examination of researchers' decision making. *Educational Psychologist, 40*(1), 13–25. https://doi.org/10.1207/s15326985ep4001_2

Pineda Hoyos, J. E., & Tamayo Cano, L. H. (2016). E-moderating and e-tivities: The implementation of a workshop to develop online teaching skills in in-service educators. *PROFILE Issues in Educators' Professional Development, 18*(1), 97-114. https://doi.org/10.15446/profile.v18n1.44269

ten Dam, G. T. M., & Blom, S. (2006). Learning through participation. The potential of school-based teacher education for developing a professional identity. *Teaching and Teacher Education*, *22*(6), 647-660. https://doi.org/10.1016/j.tate.2006.03.003

Shin, D. S., & Kang, H. S. (2018). Online language teacher education: Practices and possibilities. *RELC Journal*, *49*(3), 369-380. https://doi.org/10.1177/0033688217716535

Schrenk, N., Alves, K., Van Dam, D., & Schrenk, B. (2021). Reflecting on best practices for online learning in a post-COVID-19 world. *Online Learning, 25*(4), 486-504. DOI: 10.24059/olj.v25i4.2460

Stein, M., Smith, M., & Silver, E. (1999). The development of professional developers: Learning to assist educators in new settings in new ways. *Harvard Educational Review*, *69*(3), 237-269. https://lsc-net.terc.edu/do/paper/8226/show/use_set-teacher_pd.html

Stürmer, K., Könings, K. D., & Seidel, T. (2013). Declarative knowledge and professional vision in teacher education: Effect of courses in teaching and learning. *British Journal of Educational Psychology*, *83*(3), 467-483. https://doi.org/10.1111/j.2044-8279.2012.02075.x

van Es, E. A., & Sherin, M. G. (2002). Learning to notice: Scaffolding new educators' interpretations of classroom interactions. *Journal of Technology and Teacher Education*, *10*(4), 571-596. https://www.learntechlib.org/primary/p/9171/

Vinagre, M. (2017). Developing educators' telecollaborative competences in online experiential learning. *System*, *64*, 34-45. https://doi.org/10.1016/j.system.2016.12.002

Whyte, S. (2011). Learning to teach with videoconferencing in primary foreign language classrooms. *ReCALL*, *23*(3), 271-293. https://doi.org/10.1017/S0958344011000188

Appendix A
Survey Questions

1. How long have you been teaching language(s)?
   - Less than 1 year
   - 1-2 years
   - 3-5 years
   - 6-10 years
   - over 10 years

2. How long have you been teaching *language(s)* online?
   - Less than 1 year
   - 1-2 years
   - 3-5 years
   - 6-10 years
   - over 10 years

3. Do you teach languages
   - fully online
   - blended
   - both

4. What are some of your sources of knowledge and skill when it comes to teaching languages online (Select all that apply):
   - Colleagues/peers
   - Conferences (please specify which)
   - Professional development workshops (please specify which)
   - University courses (please specify which)
   - Books and articles (please specify which)
   - Online resources
   - Self-reflection on practical experience
   - Other (please specify)

5. How do you see these prior learning experiences influencing the ways you teach online?
6. We would like to conduct follow-up interviews to clarify your answers and to deepen understanding about how you *are developing as online language teacher.* If you don't mind if we contact you via Skype for a 30-40 minute interview, please write your name and your email address to set up a meeting time.
   Name: _____
   Email: _____

Appendix B
Interview Questions

1. In an ideal world, my online teaching would look like:
2. Describe the philosophy and instructional approaches of your favorite teacher, online or live.
3. Describe your view of yourself as an online educator. How do you see yourself as an online educator in the future?
4. How might your online students describe you as an online teacher?
5. If you were asked by a colleague to describe yourself as an online educator, what would you say?
6. What sorts of experiences do you see as most beneficial in developing as an online language educator?
7. What particular kinds of knowledge and reasoning do you see coming into play when considering online language teaching?
8. Other observations about teaching and learning online that you would like to share?
9. Challenges?

Appendix C

Recruitment Letter

Invitation to Participate in an Online Language Educator Study

We are seeking experienced online language educators to participate in a study on the development of teaching skills for online language teaching.

 If you are or ever have been an online language educator, please complete our questionnaire regarding your experiences. It will take approximately 15 minutes of your time to complete (the link is included below).

Click on this link or copy and paste it into your browser to access the survey:

Thank you for your consideration.
Please let us know if you have questions.